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THE RELATION BETWEEN THREE INTERPERSONAL VARIABLES AND COMMUNICATION EFFECTIVENESS: A PILOT STUDY

CLOVIS SHEPHERD AND IRVING R. WESCHLER*

University of California, Los Angeles

THE PROBLEM

This study is designed to clarify the relation between three variables in the interpersonal situation (status, affective relations, and organizational structure) and communication effectiveness.[1] Communication difficulties serve as the measure of communication effectiveness. Broadly speaking, we postulate that people who work together, in individual or group contacts, encounter fewer difficulties in communicating with each other if they have low status differences between them, like each other, and show good understanding of, conformity to, and satisfaction with the organizational structure.

Communication failures occur either at the initial phases of an organization's life, as it develops its objectives, or later, when these and newer objectives are implemented through action. It appears to us that one fruitful way to analyze communication failures is to identify and analyze difficulties as they develop through time, from the inception of a project until its conclusion.

Although communication difficulties within an organization can be traced to a variety of sources (including situational sources, such as poor facilities, lack of financial support or content sources, such as poor intelligi-

*This study of the Human Relations Research Group, UCLA, was conducted under a grant of the U. S. Office of Naval Research. The authors gratefully acknowledge the assistance of Miss Mary Bob Cross in planning and collecting data for this study

[1]In the last few years, a number of empirical studies have attempted to relate the communication process to organizational effectiveness. Among these are:

Caudill, William, and Edward Stainbrook, "Some Covert Effects of Communication Difficulties in a Psychiatric Hospital," *Psychiatry,* 17, 1 (February 1954), 27-40.

Davis, Keith, "A Method of Studying Communication Patterns in Organizations," *Personnel Psychology,* 6 (Autumn 1953), 301-312.

Festinger, Leon and others, *Theory and Experiment in Social Communication,* University of Michigan, Research Center for Group Dynamics, October 1950.

Hertz, David B. and Albert H. Rubenstein, *Team Research,* Boston and New York, Eastern Technical Publications, June 1953.

Jacobson, Eugene, and Stanley E. Seashore, "Communication Practices in Complex Organizations," *Journal of Social Issues,* 7, 3 (1951), 28-40.

bility of documents, etc.), we shall be concerned only with those difficulties whose roots are in the interpersonal relations among the people working together on a common task.

Procedure

A pilot study was conducted which focused on a series of ordnance equipment tests in a government naval laboratory. The work group participating in these tests consisted of fifteen people from various organizational units who coördinated their efforts over a period of approximately four months. Twelve of the fifteen people worked in four subgroups of three each, with the other three providing technical support on an individual basis. The gradually unfolding nature of the task objectives and their implementation, the involvement of different organizational groups, and the existence of a clearly defined time span were to us the major attractive research features of the problem.

Planning for these ordnance equipment tests had begun early in the spring of 1953, but most of the work was done during a two-month period which culminated in August with the tests themselves. These tests were only one phase of a larger project involving the development of the same weapon, but they constituted a sufficiently distinct phase to isolate them for study.

The field work, which was designed to concentrate on the communication process among the fifteen co-workers, utilized two types of instruments: (1) a structured interview and (2) a sociometric questionnaire. It was conducted during the end of August and early September, 1953.

Each person interviewed provided information on such aspects as time, source, and media of first and subsequent assignments, the circumstances under which assignments were formalized, the relationship between so-called formal and informal channels of communications, the perception of specific events by different participants, the nature of difficulties experienced in communicating, and so forth.

The protocols covered a time span ending with August 13. This was the day when it was more or less accidentally discovered that three of the four models of the weapon being tested had been damaged in previous tests. Since no one had expected damage to occur, this discovery caused a great deal of excitement and all participants were keenly aware of what had happened.

The sociometric questionnaire consisted of two parts. The first, designed to obtain information on perceptions with reference to the *organiza-*

tional structure, utilized a modification of the Multi-Relational Sociometric Survey (MSS).[2] Organizational structure refers to the prescribed relations among positions. It yielded indices of organizational understanding, conformity, and satisfaction through a comparison of the organizational prescriptions with the subjects' choices for perceived, actual, desired, and rejected work partners. The second part was designed to gather additional information regarding the *affective relations* (like, neutral, or dislike) between the persons. Each respondent was asked to indicate the five persons he most liked to work with and the five persons he least liked to work with. Several indices were developed from these choices taking into account various forms of mutual choice, ambivalent feelings, or neutral relations.

The final variable to be operationalized was *status,* that is, the subjects' rights, duties, and expected behaviors within the organization. An index was devised based on three important status hierarchies. Research within organizations has not yet sufficiently clarified the number of hierarchies and their relative weights, nor their interrelations in terms of congruency[3] and consistency.[4] In addition, the problem of uni-dimensionality of status hierarchies remains unresolved. For instance, income, age, and education are easily scalable; occupations can be scaled fairly well; however, "power" or "supervisory position" represents a difficult problem, especially with staff people or consultants. The status index finally used was composed of scores based on (1) an income hierarchy, (2) a supervisory position hierarchy, and (3) a "prestige of work-group" hierarchy.

Communication effectiveness was determined from an analysis of interpersonal communication difficulties. Two types of communication difficulties were postulated: *expressed difficulties* which the respondents felt and verbalized, and *inferred difficulties* which the respondents perceived but were unwilling to discuss (unexpressed difficulties) or which they in fact encountered but of which they remained psychologically unaware (disassociated

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[2]For a detailed description of the rationale for the MSS, see Fred Massarik, Robert Tannenbaum, Murray Kahane, and Irving R. Weschler, "Sociometric Choice and Organizational Effectiveness: A Multi-Relational Approach," SOCIOMETRY, 16 (August 1953), 211-238. For a more popular statement, see Irving R. Weschler, Robert Tannenbaum, and Eugene Talbot, "A New Management Tool: The Multi-Relational Sociometric Survey," *Personnel,* 29 (July 1952), 85-94.

[3]Adams, Stuart, "Status Congruency as a Variable in Small Group Performance," *Social Forces,* 32 (1953), 16-22.

[4]Lenski, Gerhard E., "Status Crystallization: A Non-vertical Dimension of Social Status," *American Sociological Review,* 19 (1954), 405-413.

difficulties). Expressed difficulties were easily detected since they were found in the replies to specific interview questions. The determination of the inferred difficulties required more subtle techniques such as analyses of discrepancies in responses of various subjects to the same questions, checking of officials records, and additional depth interviews.

Findings and Discussion

Our total sample[5] included four organizational subgroups of three persons each. Two of these subgroups had low status differences within each subgroup (the lows), and two had high status differences within each subgroup (the highs). The lows were pooled and contrasted with the highs, and were found to have higher positive in-group choice ($t = 2.876$)[6], fewer expressed difficulties ($t = 2.99$), but not significantly fewer inferred difficulties nor significantly different MSS indices.[7] With reference to the organizational subgroups, these findings substantiated the hypothesized relation between status differences, sociometric choice, and expressed communication difficulties.

In order to test more fully the relation between the three interpersonal variables and expressed communication difficulties, a four-dimensional table was prepared (see Table 1). Each cell of this table simultaneously relates the three independent variables, with the dyad serving as the basic unit. It includes *all* dyadic relations, regardless of organizational subgroups.

Each variable in the dyadic relationship was categorized as follows with reference to interpersonal relations, the dyads were dichotomized into those which contained expressed difficulties and those which did not; status was trichotomized into those which had high (H), medium (M), and low (L) status differences; sociometric choice was trichotomized into those dyads in which there were one or both choices as "like most" (+), those dyads

[5]In view of the small sample, definitive findings cannot be presented, but this analysis is intended to suggest the kinds and treatment of data that could be expected with the use of larger samples.

[6]At the .02 level of significance, $t = 2.764$.

[7]MSS indices of understanding indicate how well people perceive correctly the rôle which is prescribed for them in the organization; MSS indices of conformity refer to the degree to which people accept the rôle which is prescribed for them or which they perceive as being prescribed for them; and finally MSS indices of satisfaction measure the degree of satisfaction which people express for the rôle relationships which are prescribed for them, or which they perceive as being prescribed for them or which they actually are engaged in.

in which no choices were expressed (0), and those dyads in which one or both choices were "like least" (—); organizational structure was dichotomized into those who were either prescribed to or actually did work closely with each other (WT), and those who were neither prescribed to nor actually did work closely with each other (NWT). Thus, for example, the

TABLE 1

EXPRESSED DIFFICULTIES IN DYADS, BY SOCIOMETRIC CHOICE, ORGANIZATIONAL STRUCTURE, AND STATUS DIFFERENCE

(Figures indicate the percentage of dyads in each cell which had expressed difficulties. Number in parenthesis indicates the number of dyads on which the percentage is based.)

Status Differences	Sociometric Choice in Terms of Organizational Structure								
	(+)			(0)			(—)		
	WT	NWT	Total	WT	NWT	Total	WT	NWT	Total
H	75	0	60	0	50	50	100	25	33
	(4)	(1)	(5)	(0)	(6)	(6)	(1)	(8)	(9)
M	30	22	26	100	57	62	60	50	52
	(10)	(9)	(19)	(1)	(7)	(8)	(5)	(22)	(27)
L	37	12	25	0	50	33	100	43	67
	(8)	(8)	(16)	(1)	(2)	(3)	(5)	(7)	(12)
Total	41	17	30	50	53	53	82	43	52
	(22)	(18)	(40)	(2)	(15)	(17)	(11)	(37)	(48)

upper left hand cell illustrates four dyads in which there were high status differences, one or both persons chose the other as "like most," both persons were either prescribed to or actually did work with each other, and three out of four (75%) of these dyads had expressed difficulties.

The table indicates that, on the whole, those dyads with positive sociometric choice appear to have the least amount of expressed difficulties (see totals). Among those with high status differences, the percentage of expressed difficulties is highest for those with positive sociometric choice. Many of these involve the director of the project. In this instance, many expressed difficulties over which he may have no control may be seen by his subordinates as directly due to him. Among those with medium status differences, the percentage of expressed difficulties is highest for those with no choice, next highest for those with negative choice, and least for those with positive choice. Among those with low status differences, the percentage of expressed difficulties is highest for those with negative choice, and least for those with positive choice.

By comparing the figures for organizational structure, expressed difficulties are generally greater among those who work closely together. One exception can be found among those who do not choose each other, though in this case the *n* is extremely small (see totals).

Status differences appear not related to expressed difficulties, if the other two variables (affective relations and organizational structure) are ignored (H: 45%, M: 44%, and L: 42%).

The same total percentage (44) of all dyads had *inferred difficulties* as had *expressed difficulties*. However, when a matrix of inferred difficulties is superimposed on this table, only slightly more than half of those dyads having expressed difficulties also have inferred difficulties. The rest of the inferred difficulties occur among those dyads who do not have expressed difficulties, and the highest percentages of these occur among those who have positive sociometric choice.

The findings with respect to sociometric choice indicate that positive feelings contribute to the absence of expressed communication difficulties. However, even though people who like each other may be unwilling or unable to recognize or acknowledge the existence of communication difficulties, our analysis of inferred difficulties suggests that in many instances communication failures exist nevertheless. In view of the good feelings between the respondents, these inferred difficulties may in the long run be easier to deal with, provided they can be brought into the open as problems which need to be corrected.

With reference to the MSS choices, the fact that those persons who work closely together have more expressed difficulties than those persons who do not work closely together suggests that close working relations may lead to increased need for detailed communication and, thus, increased opportunity for misunderstanding. In addition, increased ego-involvement in the work may lead to some distortion in perception.

Implications

In setting up a similar study on a larger scale, the following considerations should be borne in mind. The basic design assumes status, affective relations and organizational structure to be the independent variables, while expressed and inferred communication difficulties are viewed as the dependent variables. Each of these variables presents numerous research problems.

Status hierarchies can be established in a variety of ways. It makes a great difference who establishes the hierarchies (i.e., the researchers or the subjects) and along what dimensions they are established (i.e., income, oc-

cupation, class, supervisory position, etc.). Setting up relevant status hierarchies requires intensive preliminary investigation of the setting in which the study is to be conducted and an explicit awareness of the theoretical implications of whatever dimensions are finally selected. The establishment of a final single status index is likely to involve a number of arbitrary decisions, but may be essential to permit ranking of individuals and groups.

Affective relations can be operationalized either in terms of generalized or specific criteria. A generalized criterion might require choices with reference to the total personality (i.e., overall liking for an individual) or with reference to his job effectiveness (i.e., overall judgment of his contributions to the organization as a whole). Specific criteria requires choices to be made either in terms of specific personality traits (i.e., intelligence, sensitivity, etc.) or in terms of functional organizational rôles (i.e., effectiveness as work partner, originator of ideas, etc.).

The analysis and interpretation of affective choice data presents at least four major problems. First, whatever criterion is chosen, it is difficult to separate the true affective component of a choice from the other relevant influences which are inherent in the criterion. Thus, the choice of a supervisor might include technical as well as personal considerations. Second, we know as yet of no adequate method to combine into a single index both positive and negative choices received by a single individual—in other words, we are unable to distinguish with one index those persons who are seen differently by different people from those who are not responded to at all. Third, we are unable to establish norms which could tell us whether the number and nature of choices received by a given individual in a given position accurately reflect the affective pull which he can be expected to exert in his organizational rôle. Thus, it is difficult to know whether a person is chosen because of the status inherent in his position or because of the personal impact which he has upon the people with whom he works. Finally, the real reasons behind each choice are not available without intensive investigation into the motives of the protagonists. This process, which may require depth interviewing or the use of projective devices, is not likely to be feasible in the average task-oriented organization.

The *organizational structure,* as determined with the aid of the MSS, requires that those activities be identified which are clearly directed toward the attainment of organizational goals. The relevant goal-directed activities[8]

[8]The activities, through which people relate to each other, will vary in kind and importance from organization to organization. Thus, while writing reports to one another might be of key relevance in a research laboratory, it may have no functional significance in an assembly type manufacturing operation.

are likely to vary from organization to organization, and valid judgments with reference to their selection are difficult to make.

Communication difficulties are either *expressed* or must be *inferred*. The types of personalities in interaction, their formal relation to each other, and the specific organizational circumstances will determine the richness and validity of free expression.

In getting at the nature of communication difficulties, the researcher is dealing largely with attitudes and feelings. For that reason, he must decide when to rely on direct, open questions as compared to more indirect projective devices or data analysis techniques. His decision will be influenced by his evaluation of the following: the organizational "atmosphere" which promotes or hinders the free expression of difficulties; the "frustration tolerance" of the respondents to recognize and accept whatever personal threat is implied through open discussion; and the respondents' skills to detect and verbalize their reactions to difficulties they encounter.

In utilizing expressed difficulties as a criterion of communication effectiveness it is likely that more confidence can be placed in the validity of situational or content than interpersonal difficulties. People appear less hesitant to complain about budget allocations or clumsy official orders than about poor personal relations, especially with peers or superiors.

The determination of inferred difficulties presents the greatest methodological problem. If discrepancies in response by different subjects are to be utilized as sources of inference, the researcher must evaluate first the materials (i.e., documents, questionnaires, interview data) available for analysis, secondly, the semantic ambiguity with which these materials are endowed, and thirdly, the saliency which they are likely to have had for the subjects. In addition, discrepancies are only one indicator of inferred difficulties. The interview protocols can be "read between the lines," and are likely to provide numerous clues to strains and stresses in the organization, not apparent in any other way. As with expressed difficulties, the most fruitful way to quantify the data is to establish the number of dyadic relations in which inferred communication difficulties can be identified.

METHODOLOGICAL PROBLEMS IN THE APPLICATION OF SOCIOMETRY UNDER "UNCONTROLLED" CONDITIONS

BERNARD J. JAMES

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This paper is a brief report upon some aspects of research recently conducted with respect to the behavior of a small group.[1] The research involved the application of several sociometric methods to the study of a small group under completely "natural" field conditions. The group, comprised of thirty-five adults between the ages of twenty and fifty-five, is a community amateur theatre group which organized during March and April of 1953. It was under continuous observation and study from March of 1953 to June of 1954.

The purpose of the research was to determine (a) what factors made for success or failure of amateur theatre-group endeavors, and (b) to estimate the effects upon inter-personal relations of such group activity. The design of the research project involved analysis of such factors as: goal definitions, goal distribution, concensus, leadership, motivations, etc., within the group over an extended period of time.

The theatre-group study sought to combine a variety of field methods and analytical tools taken from sociology anthropology and social psychology. In brief, the methods used included (a) participant-observer methods for recording the basic body of data, (b) special observational inventories and cue lists suggested by laboratory studies of small groups, e.g., Bales (1), (c) several technical devices for recording notes on tape to preserve as much data as possible while at the same time avoiding use of paper-pencil devices in observing the group, (d) coding of notes transcribed from tapes so that they would be amenable to systematic analysis, and (e) the application of some sociometric methods, e.g., the sociogram and matrix, to the data.

Some obvious methodological considerations prompted the effort to combine these various methods. Researchers are pretty well in agreement that

[1] As part of a research program conducted by the Wisconsin Idea Theatre of the University of Wisconsin Extension Division and supported in part by Rockefeller Foundation, the researcher worked from January, 1953, until July, 1954, on various studies of cultural-art activity in the state of Wisconsin. He wishes to thank Professor Robert Gard of Wisconsin Idea Theatre for his aid in the research and Dr. Harold W. Montross, Assistant Director of the University Extension Center at Racine, for his helpful criticisms during the preparation of the report from which this paper is in part drawn.

under field conditions note taking, or recording (unless done illicitly) upsets the "natural" quality of group behavior (5). On the other hand, the usual paper-pencil sociometric methods involve either a structured interview or use of some sort of semi-structured situation in order to systematically draw out a body of sociometric judgments. There seems to be no available method for gathering data on groups in the field which preserves "all" of the information that might be valuable to the researcher without upsetting the "natural" situation. No participant-observer can hope to recall extended discussion data verbatim, and, of course, the direction of his attention inevitably filters his material. But given a well-considered plan of research, and thus conscious control of focus, and given inventory devices to assist recall, a quite reliable set of data can be obtained. Methods such as these enabled the researcher to record data while it was still fresh in mind, to interpolate comment on facial and postural responses, and to add interpretive comment suggested by the immediate conditions of the field. Tape recording field notes also permitted the researcher to code data, thus to protect those with whom he was working, and so better use confidential information.

The use of notes and recordings as basic data from which sociometric ratings are abstracted is, of course, not new. Moreno used the running conversation type of data for his study, for instance, of what he referred to as the "sociometric survey of motivations" in children's groups (3). The value of anecdotal data has likewise been widely appreciated and it has been used, for example, in the field of guidance for some time (4). Usually, however, group studies based on data gathered under such "natural" conditions are not extended over a sufficiently long period of time to enable the researcher to study the change of choice-rejection relationships within a group.[2] In the case of the theatre group it was the shift and re-alignment of these relationships which proved highly significant to the analysis. Study of problems such as that of "concensus," of course, requires temporal extension and the longer the period of time the more reliable the conclusions (other things equal).

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[2] To meet some of these difficulties methods using time as a measure of sociometric relations have been employed. The amount of time which persons voluntarily give one another in social relations is interpreted as a form of sociometric rating. However, researchers using this method point out that it must be used in conjunction with other devices, such as the rating comment, in order to "weigh" the strength of rejection or choice. See Moreno, J. L., Jennings, Helen J., and Sargent, Joseph H. "Time as a Measure of Interpersonal Relations." *Sociometry Monographs*. No. 13. 1947, pp. 1-8.

A brief sample selection of notes can be given here to illustrate the nature of the notes and how rating statements appear *in situ*.

At one point in the meeting R-3 suggested that there ought to be director tryouts. This was an obvious jab at R-2 and she made no comment. Others nodded approval. R-2 flushed but said nothing. At 11 o'clock the formal atmosphere began to give way and the group broke into two clusters, one surrounding R-3, the other about R-2. One group went into the kitchen and the other stayed in the den. I went into the kitchen with the first group and the conversation there concerned R-3 as possible director. He protested to E-4 who was pressuring him to accept it and she said at one point, "But don't you see, we need a leader." . . . the meeting began to break up. I met R-3 afterward and he said of R-2, "I sized her up right away. She's the kind that wants everything run her way. I hope she falls on her prat on that first play."

R-2 called and told me that E-4 was trying to join the group of P-4. "She more or less invited herself to his meetings. I guess she's quitting our group. She only wants to participate in things if it means something to her status. She's a selfish damn pig."

E-4 said the trouble with the group was that, "There aren't enough people in it to give it impetus by their names alone." When R-2 asked her who she meant she said, "Well, I mean people like M-4. People like that."

Beyond the mechanical difficulties, a methodological problem is involved in the approach outlined here. Although the methods permit us to maintain much of the "natural" quality of group (or two-person conversation) situations, they also preclude any control over the situation in which the observer is working. Since no rating inventories are used, or any "standard" method of that sort, the researcher has no control over the number or quality of ratings or over the conditions under which they occur. The absence of control over rating volume and rating quality makes the application of many statistical devices very difficult if not impossible.

There are, however, three problems to which "uncontrolled" sociometric analysis seems particularly well suited. These are the problems of (a) relative rating frequencies between individuals in a group, (b) the relative rating intensity of individuals in a group, and (c) the ambivalent or mixed positive-negative rating habits of an individual. These three phenomena are clearly vital to the study of the emotional energy of an individual-in-a-group, to the study of leadership, and to the analysis of group stability, morale and efficiency.

The fact that persons may be relatively frequent or infrequent raters or that they may be relatively passive or intense raters, is, to be sure a com-

monplace of everyday experience. But an estimation of the frequency or intensity of a person's rating behavior can be a significant clue to both the individual's standing in a group and his general psychological adjustment.[3] Ambivalent rating, on the other hand, may be a key to group instability. Since patterns of influence in a group appear to relate to the number and intensity of ratings that various members place in circulation in the group, it is imperative that the researcher be able to locate the source of such ratings in the group and observe their function over a period of time.

At this point some illustrations of how the methods discussed above were used to study the theatre group can be cited. A resume of the group's history will serve as a background.[4]

The group's major structural changes occurred in four saltations, each period of abrupt change involving the formation or dissolution of a clique. During the summer of 1953 the group was structurally rather inchoate. Only one established reciprocal choice association pattern (four women, two forming a strong friendship pair) was identifiable in the first five months of activity. In Figure 2 this pattern is shown surrounding subject P. During September of 1953, because of violent disagreement between subjects F and E, subject E left the group and formed a rival group. Several persons from the theatre group attempted to function in both groups simultaneously. Thus the new group and the theatre group remained functionally adjacent although not actually working toward similar ends. (The group formed about E devoted itself to song-and-dance and comedy pantomime acts). In October

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[3] This is a point at which Dahle and Monahan have leveled criticism of indiscriminate use of sociometry in the school. These authors maintain that limiting the volume of rating, or forcing a child to rate, regardless of his inclination, may give results which "miss the wider context of social relations" . . . "a child should not be asked to make a choice when he has none to make, and, on the other hand, he should not be asked to make omnibus choices or to evaluate everybody." See Dahle, H. Otto and Monahan, Thomas O. "Problems in the Application of Sociometry to Schools." *School Review*. Vol. 57. 1949. P. 227.

[4] The problem of actually defining the limits of the theatre group is difficult. All members did not participate equally often or with equal intensity. There was, in fact, a distinct gradient of participation frequency from continuous to occasional activity. The frequency of participation need not, however, correlate with intensity of participation. Both dimensions (frequency and intensity) must therefore be considered in definitions of groups. The researcher sought to include all persons in the "group" who did participate directly in it during the research period. For discussion of the problem of participation frequency see Homan, George C. *The Human Group*. New York. 1950. Pp. 82-86.

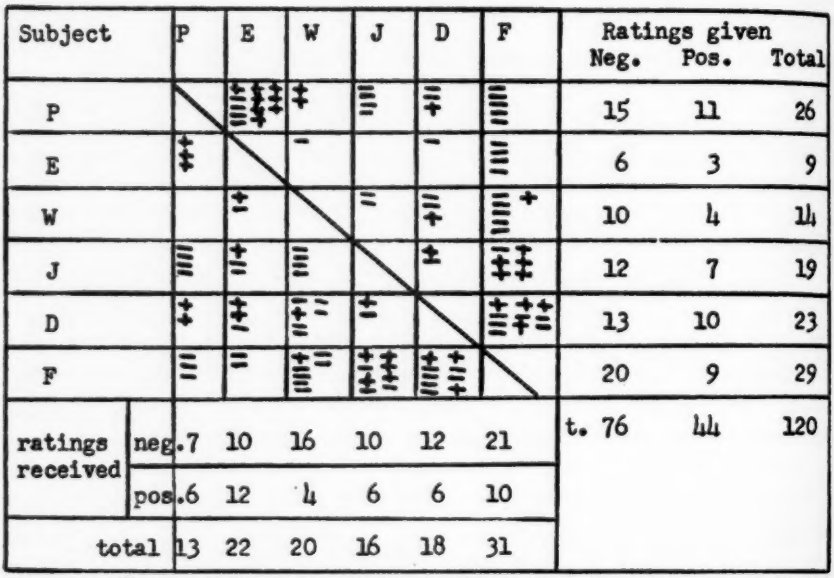
of 1953, because of the failure of formal leadership (W was president) to hold membership together and solidify opinion concerning goals, subject J formed another group. This group was professedly a part of the original theatre group but was formed by J by bringing into the theatre organization four persons not previously involved. Thus he sought to bolster his isolated position in the group (he had no reciprocal choice ties to other membership) by forming a clique of his own. Because of factors largely "external" to the actual problem of theatrical productions (e.g., factors such as class-attitude and community prestige) J was unable to spread his influence in the group beyond the confines of his clique and after the production of a skit of a very trivial sort this clique gradually dissolved. During the months of December and January sporadic activity of thirteen members of the theatre group occurred in connection with a scheme, promoted by subject D, to produce radio theatrical productions. However, this effort failed when D alienated the manager of the local radio station. There followed another attemp by J to build alliances by recruiting friends into the theatre group. This move was undercut by subjects D and P who drew nine women together (ignoring the recruits of J) and produced a small musical comedy skit. Only twelve people attended this "show." Although such skits were not produced for public performance but as training plays the attendance was about a fourth of the attendance at the skit produced by J. By June of 1954 the theatre group was floundering. However, efforts since that time to get the group on its feet again and working toward a "serious" theatre goal have met some success and the group may yet establish itself firmly.

During the fifteen months in which the group was under observation, a volume of about eight hundred ratings were noted. As these ratings were isolated in a running marginal analysis of transcribed data, those ratings which were not clear, or those over which observers disagreed or had doubts (from time to time two persons in the group were used as checks upon the researcher's observations), were eliminated from the matrices prepared to record ratings each month. In preparation of sociograms, however, rating data was used so that it would best reflect the saltatory change of the group rather than by arbitrary monthly periods. The group's change was only incidentally affected by the fact that it held monthly meetings.

If we select a block of ratings from the data collected throughout the research period we can illustrate the change within the theatre group in terms of fluctuating rating relationships. For the purposes at hand, ratings for the months of September through December can be used. It is necessary to select such a block of ratings because the theatre group functioned under

special conditions through the summer of 1953 (committee meetings only) and because after December major changes in the participation of several key persons took place. Our purpose here is not to trace the evolution of the group but to indicate how a volume of ratings can be used with respect to frequency, intensity and ambivalence in choice-rejection behavior.

In order to avoid further complications with regard to infrequent participants on the "fringes" of the group we can select ratings for six persons whose positions in the group were sociometrically strategic or influential. The rating relationships between these six persons during the four-



Subject	P	E	W	J	D	F	Ratings given Neg.	Pos.	Total
P		+++++	+	=	=+	=	15	11	26
E	++		-		-	=	6	3	9
W		+-		=	=+	=+	10	4	14
J	=	+-	=		+-	+++	12	7	19
D	+-	+-	=-	+-		=+++-	13	10	23
F	=	=	=+-	+++	=+-		20	9	29
ratings received neg.	7	10	16	10	12	21	t. 76	44	120
ratings received pos.	6	12	4	6	6	10			
total	13	22	20	16	18	31			

FIGURE 1. Choice-rejection Rating Matrix for Six Subjects for a Four Month Period.

month period chosen for illustration can be seen in Figure 1 below. The positions of these six subjects with respect to the total theatre and song-and-dance membership can be seen in Figure 2.

In examining the rating figures in Figure 1 we find that one hundred and twenty ratings were obtained during four months for six subjects with a mean average of 20 ratings per person. The mean deviation of the number of emitted ratings is 6 per person and the mean deviation of the number of ratings received per person is 4.3. It would seem, therefore, that we have here a fairly evenly spread sample of ratings between these subjects, although only nine ratings emitted by E were recorded for these six subjects. This is

largely because he left the theatre group early in the period covered by the matrix and because, judging by subsequent rating data from this individual, he is not given to frequent choice-rejection statements.

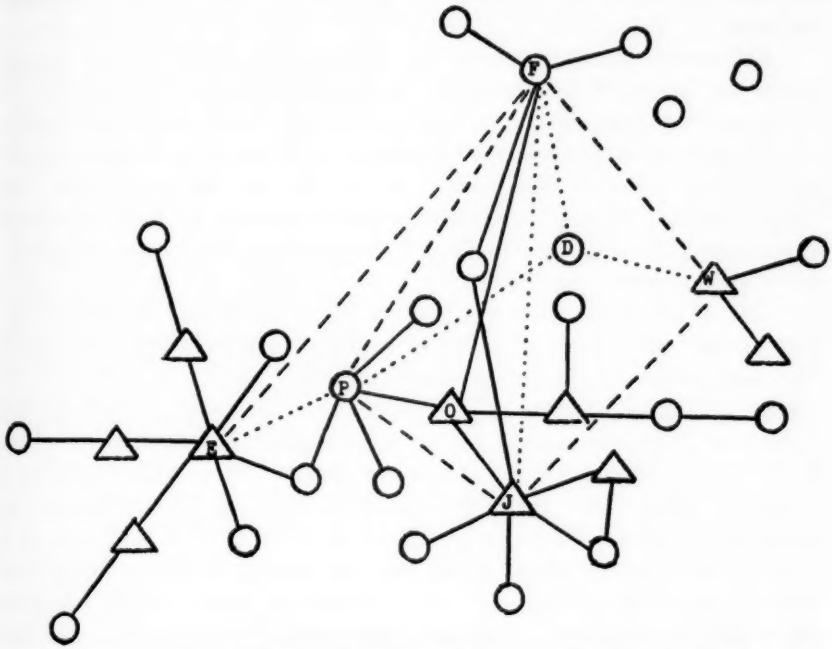


FIGURE 2. Sociogram for the Theatre Group and E Group Based on Reciprocal Choice (unbroken lines), Reciprocal Rejection (broken lines), and Ambivalent Ratings (dotted lines) for Months from March 1953 to March 1954.

Males are indicated by triangles, females by circles. The observer (O) occupies a sort of liaison position between persons such as P, J and F as a necessary feature of his role and for obvious methodological reasons. For diagrammatic purposes rejection lines tend to maximize distance and choice lines tend to minimize distance between subjects. The relative length of lines does not imply, however, a high degree of representational exactitude. For discussion of problems of charting sociometric data see Proctor, Charles H., and Loomis, Charles P. "Analysis of Sociometric Data." *Research Methods in Social Relations*. Part 2. Edited by Maria Jahoda, Morton Deutsch and Stuart W. Cook. New York. 1951.

The relative negativism associated with subject F can be observed in the fact that she emits about 26% of the negative ratings (about twice the mean average). However, the general negative tone of the social relations of these six persons in the theatre group is seen in the fact that 63% of

the total number of ratings are negative. With subject F removed from the calculations the percentage of negative ratings decreases to 61%. Thus although the group's poor internal relations (those represented especially by the inter-clique relations of these six subjects) are general, they focus in particular on F.

Estimations made concerning the relative frequency of negative ratings within the cliques of the theatre group suggest that less than 10% of the ratings are negative. Of course, this is what one would expect since people will not work together (assuming the situation is free of compulsive factors, e.g., salaries in professional groups) if they do not like each other. The "clique," in fact, as it is defined here, means a working, reciprocal choice set of relations. In the case of the theatre cliques these relations formed usually hub-spoke patterns. (See Figure 2.)

The mixed positive-negative (ambivalent) relationship of several subjects in the theatre group is evident in several cells of the matrix in Figure 1. The cells indicating the rating relationships of P/E, D/F, F/J and F/D deserve particular attention. We have here a volume of 39 ratings with just under 10 ratings per cell. Whereas the rating of subject W of subject E, for example, has one positive and one negative rating which indicates a temporary relation and cessation of contact (this must be determined by group history data), P's rating of E, and those by D of F, and those of F of J and D indicate continuous but unstable judgments between these individuals. The relationship of D and F is one in which two women (who are neighbors) continue to associate but continue to rate each other both positively and negatively. Neither person knows quite "where the other stands." The relationship is never consistently negative (as in the rating of P of F) so that the two women avoid each other, nor consistently positive so that a serviceable social relationship may be established.

The behavior of the ambivalent rater in a group can be illustrated by subject D. She is a medium-sized woman of about thirty-five years, married and has a small son of three years. She is Jewish as is her husband who is in the salvage business and does rather well financially. D is extremely status-prestige conscious and has developed all sorts of affectations and social devices to instrument her struggle for greater self-esteem. She speaks in a very affected way with fluttering eyelids and studiedly graceful gestures. She and her husband own a home worth about $20,000 and D uses it as a kind of status lever, "entertaining friends," "having them in for cocktails" and the like. She convinced her husband that it would be better to own a used Cadillac than a new car of the lower priced field. In general she makes

or breaks her social alliances upon the test of whether or not they bring added social prestige.

Her movement in the theatre group is very striking and an excellent illustration of the social movement which accompanies ambivalent sociometric rating.

D joins theatre group in the spring of 1953. Has no reciprocal choice ties in it. →

→ During the summer D supports F as candidate for director and attempts to use this support to bargain for a role. Rejects both F and the "serious" theatre goal when she finds that casting will be on merit only.

During the winter D begins to promote a radio theatre goal and organizes practice sessions at her home. Is very excited about the idea of herself as a radio player. Alienates manager of local radio station by pestering him about scripts. Abandons goals and alliances with others in the project. →

→ During late winter D attempts to join the song-and-dance group of E and rates him positively. She has had some dance training and again sees herself as a potential "star." Is rebuffed by E who treats her cooly and she reverts to a negative rating of him.

During the spring D begins to promote plans for a musical comedy and seeks and gains the support of P. P has been observed to emit very negative ratings of D frequently, including strong anti-semitic comments. P had joined the group of E for several months but left it because she could not do acts more to her liking. D and P in their musical comedy goal refuse to support J who was endeavoring to produce a play.

Such shifts of goals and social alliances are reflected in the rating habits of this subject over her entire period of participation in the theatre group. The instability of her sociometric position in the group is seen even in the brief period represented by Figure 1. The series of "snipe-like flights" (to use Samuel Butler's famous description of his Earnest's continuous goal revisions) which D made demonstrates how rating analysis can serve in the

study of group instability. Since she was active in the group her constant movement caused frequent changes in the general constitution of the group's behavior.

By the analysis of a volume of rating data as outlined here, in conjunction with other observational information about a group, one can study the phenomenon of leadership "in depth" and trace out the patterns of influence and concensus. Ratings in the theatre group were often the medium through which conformity pressure was exerted in the group. Strong, dominant individuals first communicated their influence along the lines of stable choice relations and then sought to use their coterie of supporters to extend the field of influence to those whose opinion was widely different.[5] Thus the study of group behavior by means of "uncontrolled" sociometrics seems to provide one way of getting at the subtle forces of leadership and influence.

Rating intensity is perhaps a more complicated problem than either that of rating frequency or ambivalence. It is, as Festinger points out (2), an obvious fact that there are degrees of liking and disliking and degrees of "susceptability to influence." And it is theoretically possible to scale ratings in terms of their intensity. However, a host of methodological problems are involved. Ratings can be, for instance, very ambiguous both to the person at whom they are directed if he should be aware of it, and to an observer attempting to estimate one subject's feelings toward another subject. Some persons are deliberately ambiguous raters under some circumstances because they wish to be diplomatic or to "play both ends against the middle." Yet an ambiguous rating may not be just a weak or mild one. There are, in fact, several important "qualitative" dimensions (perhaps they are ultimately quantifiable) to the factor of rating intensity. The bland personality may rate others mildly because he is simply "that kind of person." Another individual might emit what appears to be the same kind of mild rating although it turns out to be, when viewed in light of other ratings and conditions, a suppressed social judgment. In either case it is necessary to accumulate a series of ratings from a single individual in order to estimate the

[5] This does not contradict the findings of Schacter, and Festinger and Thibaut who point out that communication in the small group is most frequently directed at the extreme ends of the opinion range in a group. What was found in the theatre group was that leaders spread their influence along choice lines toward those who are uncommitted and after gaining their support toward those who are "sure to put up a fight." See Schachter, Stanley. "Deviation, Rejection and Communication." *Journal of Abnormal and Social Psychology*. Vol. 46. 1951 and Festinger, Leon and Thibaut, John. "Interpersonal Communication in Small Groups." *Journal of Abnormal and Social Psychology*. Vol. 46. 1951.

comparative intensity of a subject's rating inclination. Only by so doing can a researcher avoid "missing the wider context of social relations"—to repeat the observation of Dahle and Monahan to which we have alluded.

Concluding Considerations:

Some of the difficulties of applying present sociometric methods to "uncontrolled" field situations have been touched upon. It is suggested in light of this brief consideration that:

a. Participant observer data taken under "uncontrolled" field conditions possess a high degree of integrity as basic information for use in building sociometric analyses. It helps preserve the connotative color of "natural" social relations and points up the "contaminating" influence of some of the rigorous methods of the paper-pencil sort when put to use in a field situation.

b. The application of certain simple methods of rating analysis can, in spite of their coarseness, elucidate problems of rating frequency, intensity and ambivalence where most methods now available obscure these data. By estimation of rating frequency, intensity and ambivalence on the basis of participation-observation forms of data, problems of influence, leadership, communication and intrusive factors from outside the group's immediate social space can be approached under field conditions, thus providing valuable insights into social dynamics. Problems having to do with group change, individual adjustment in the group, and the development of personality as it is coadunated with social experience, can be profitable approached by these methods.

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SOCIOMETRIC STATUS AND SOCIOMETRIC PERCEPTION

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There is conflicting evidence concerning the relationship between the sociometric status a person holds in a group and the accuracy with which he perceives certain characteristics of the group members. Wood (3) found that students of high sociometric status (receiving the largest number of sociometric choices) were more accurate judges of group opinion than those of low sociometric status (receiving few or no sociometric choices). Gage (2), on the other hand, found no relationship between these same variables. In a study comparing the sociometric status of high school students with their ability to judge the sociometric status of others, Ausubel (1) obtained correlations of approximately zero. These conflicting results may reflect differences in the type of judgments and the kind of group status being correlated, actual differences among the groups studied, or the operation of uncontrolled variables within the various groups. Nevertheless, it seems imperative that the relationship between sociometric status and accuracy of judging the characteristics of group members be investigated further.

This study is an attempt to determine the relationship between the sociometric status of individual group members and the accuracy of their sociometric perceptions. Sociometric status refers to the degree to which an individual is accepted by a group in terms of the number of choices he receives on a sociometric test. Accuracy of sociometric perception is defined as the degree to which an individual's judgments of the sociometric status of group members agrees with their actual sociometric status.

Incidental questions arose during analysis of the data and are discussed along with the other findings.

METHOD OF INVESTIGATION

The data for this study were collected in four classes in the College of Education, University of Illinois. The classes ranged in size from 21 to 30 students and all were seniors in the teacher-training curriculum at the secondary level. Since the members of each class had spent seven weeks together in daily group discussions, prior to the collection of the data, each student had an opportunity for extensive observation of the other members of his group.

The sociometric form administered to the students requested them to

indicate which five classmates they would consider *first* as future teaching companions and which five classmates they would consider *last* as future teaching companions. This was an attempt to obtain both positive and negative sociometric choices without implying rejection of any of the group members.

When the sociometric choosing was completed, it was explained to the students that a compilation of their choices would indicate the relative acceptability of the class members as teaching companions. Each student was then asked to predict this rank order. These predictions were made from the extremes of the distribution toward the center, and the students were told to include themselves in the ranking.

Thus two sets of data were provided—one indicating each individual's relative sociometric status in his group, and the other indicating each individual's judgments of the relative sociometric status of self and others.

Analysis of Data and Results

The sociometric data were analyzed by giving a +1 for each *first choice* as teaching companion and a —1 for each *last choice* as teaching companion. These scores were then added separately to provide an index of positive and negative sociometric status for each individual. In addition, the positive and negative status scores were combined for each individual to indicate his total sociometric status. The medians and ranges of these sociometric status scores, for each class, are presented in Table 1.

TABLE 1

Medians and Ranges of Positive, Negative, and Total Sociometric Status Scores in Four College Classes

Class	N	Positive Status		Negative Status		Total Status	
		Md	Range	Md	Range	Md	Range
A	21	5	0 to 9	—4	0 to —10	1	8 to — 8
B	30	4	2 to 10	—3	0 to —15	1	9 to —13
C	27	4	1 to 12	—3	0 to —16	1	12 to —13
D	26	4	0 to 11	—3	0 to —16	1	11 to —15

It will be noted in this table that the distribution of sociometric status scores was fairly uniform from class to class, with the possible exception of Class A which had a more restricted range of negative and total sociometric status scores. The fact that there was a greater dispersion of negative status scores than positive status scores, in all four classes, would tend to indicate that there was more consensus regarding which students were least preferred

as teaching companions. Correlations between the positive and negative status scores ranged from —.32 in Class B to —.70 in Class A, with an average correlation of —.52. These negative coefficients indicate a tendency for a person of high positive sociometric status to have a relatively low negative sociometric status. Consequently, combining the positive and negative sociometric status scores provides a fairly reliable index of the relative acceptability of the students as teaching companions. Thus, *accuracy of sociometric perception* was determined, in each class, by correlating the rank-order of the class members, based on their total sociometric status, with each individual's rank-order prediction of the class members' relative sociometric status. The medians and ranges of these sociometric perception accuracy scores are presented in Table 2.

TABLE 2

MEDIANS AND RANGES OF SOCIOMETRIC PERCEPTION ACCURACY SCORES IN FOUR COLLEGE CLASSES (rho's)

Class	N	Md	Range
A	21	.48	.16 to .81
B	30	.32	—.10 to .70
C	27	.49	.13 to .77
D	26	.40	.05 to .68

It is interesting to note that the lowest average accuracy score was in Class B, where the criterion was contaminated by the greatest overlapping of positive and negative status scores. However, this variation of accuracy scores among groups should have relatively little influence on the final results, since analyses of data will be confined within the specific groups. In general, the range of accuracy scores for each group indicates a wide variation among individuals in their ability to perceive the relative sociometric status of their classmates. To determine the degree to which this variation was related to the sociometric status of the perceivers, the sociometric perception accuracy scores were correlated with the total sociometric status scores of the members in each group. Table 3 reveals the results of this analysis.

All of the correlation coefficients representing the degree of relationship between sociometric status and accuracy of sociometric perception were positive, with three of them being significant beyond the 5 per cent level. The lack of significance between these variables in Class A can probably be attributed to the restricted range of sociometric status scores, as pointed out in Table 1. These data are consistent with the hypothesis that there is a

relationship between sociometric status and accuracy of sociometric perception. The direction of this relationship indicates less accurate perceptions by those students least accepted by their classmates.

TABLE 3

RELATIONSHIP BETWEEN SOCIOMETRIC STATUS AND ACCURACY OF SOCIOMETRIC PERCEPTION IN FOUR COLLEGE CLASSES (rho's)

Class	N	Sociometric Status and Accuracy	Significance Level
A	21	.21	$>.05$
B	30	.39	$<.05$
C	27	.48	$<.05$
D	26	.45	$<.05$

In order to determine the relative ability of persons with high and low sociometric status to judge the sociometric status of others, it was decided to compare the accuracy of their predictions. The accuracy scores of the five students with highest sociometric status and the five students with the lowest sociometric status in each class were converted to T-scores, to make them comparable from class to class. These accuracy scores for the students in the four college classes were then combined and averaged. The mean accuracy of the twenty students with the highest sociometric status was 57 (T-score), while the mean accuracy of the twenty students with lowest sociometric status was 44 (T-score). The difference between these means was found to be significant beyond the 1 per cent level.

The present data did not make clear the cause of this relationship between less accurate sociometric perceptions and less acceptance by the group. It may be that those who were least accepted had fewer opportunities for interpersonal relations with the group members and consequently less information upon which to make such judgments. On the other hand, it is possible that inaccurate perceptions led to behavior which was not acceptable to the group members. The most plausible direction of influence between these variables will be discussed later.

Sociometric Status and Self Perception

When making the rank order predictions of the relative sociometric status of the members in their classes, the students were told to rank themselves along with their classmates. Consequently, *accuracy of self perception* could be determined for each individual by comparing his actual rank order in the group, based on total sociometric status, with his predicted rank

order. Accuracy was thus expressed in terms of the amount of discrepancy between these two ranks. It is recognized that this is a crude measure of self perception since the discrepancy scores are distorted by a regression of the rank-order predictions. However, the degree of relationship between these self perception accuracy scores and sociometric status should at least be suggestive, if not conclusive.

It will be noted in Table 4 that the results are similar to those concerning accuracy of the sociometric perception of others, revealed in Table 3. Again, all of the correlation coefficients were positive with three of them being significant at the 5 per cent level. It appears that the individuals who were least accepted by the group had a tendency to be less accurate in perceiving their own relative sociometric status, as well as being less accurate in perceiving the sociometric status of others.

TABLE 4

RELATIONSHIP BETWEEN SOCIOMETRIC STATUS AND ACCURACY OF SELF PERCEPTION IN FOUR COLLEGE CLASSES (rho's)

Class	N	Sociometric Status and Accuracy	Significance Level
A	21	.40	$<.05$
B	30	.43	$<.05$
C	27	.32	$>.05$
D	26	.39	$<.05$

The data presented in Table 4 seem to lend support to the possibility that sociometric status was, at least in part, a function of the accuracy of sociometric perception. It was previously pointed out that inaccurate perceptions of the sociometric status of others, by the least accepted group members, may have been a result of fewer opportunities for interpersonal contacts, and consequently a less adequate basis for making such judgments. However, this direction of influence seems less likely in the case of self perception since deprivation of opportunities for interpersonal contacts should have made the least accepted students more aware of their sociometric position and thus, more accurate in the perception of their own status. This would seem especially plausible in these classroom situations where group contact was experienced even though intimate interpersonal contacts may have been withheld. In analyzing the self-prediction of the five students in each class who had the lowest sociometric status, it was found that there was an average over-prediction of thirteen ranks. In general, then, those students who were

least accepted by the group perceived themselves as having average group acceptance. In light of the above discussion, it seems possible that the behavior which led to lack of acceptance by the group members was partly a function of the low status persons' inaccurate perceptions of the attitudes and feelings of others. This, of course, does not rule out the possibility that sociometric position influenced the accuracy of sociometric perception or that both were influenced by a third variable.

Discussion of Results

The data in this study indicated a positive relationship between sociometric status and the ability to perceive the sociometric status of self and others. The size of the correlation coefficients obtained, however, would seem to indicate that the relationship between these variables is contaminated by other factors. These factors are most likely the desire and ability of individuals to react appropriately in interpersonal contacts. For example, an individual with highly accurate sociometric perceptions may lack the desire or the ability to behave in such a way as to improve his status in the group, while another person with average accuracy may put forth great effort to utilize status gaining skills. The contamination of these two factors probably accounts, in part, for the relatively small correlation coefficients found in this study and also for the contradictory results cited at the beginning of this paper. The true relationship between accuracy of sociometric perception and effectiveness in interpersonal relationships will not be determined until these two variables are controlled.

Although the direction of influence in the relationship between sociometric status and accuracy of sociometric perception was not made clear by the data, it is entirely possible that accurate sociometric perceptions may be a facilitating factor in improving one's sociometric position in a group. The desire and ability to react appropriately in interpersonal situations are probably the crucial variables determining an individual's sociometric status. However, increasing the accuracy of an individual's perceptions of the attitudes and feelings of others may facilitate the selection of appropriate responses in interpersonal contacts. Verification of this hypothesis would have practical implications for improving the social acceptability of individual group members. Present efforts are generally directed toward modifying the behavior of low status individuals and arranging situations in which they will receive recognition from the group. The relative lack of success with these procedures may be partly due to the inability of low status individuals to perceive the attitudes and feelings of others, and consequently their inability

to select behavior appropriate to the situation. Thus, attention toward improving the accuracy of their sociometric perceptions may lead to more effective efforts for improving their social acceptability.

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THE STABILITY OF SOCIOMETRIC CHOICE AMONG KINDERGARTEN CHILDREN

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Albeit a good deal has been written about both the effectiveness and efficiency of sociometric techniques in revealing leadership potential, morale level, clique formation, and the like, a paucity* of research exists insofar as determinations of the nature and extent—temporally as well as spatially—of the durability, consistency, or stability of sociometric choice is concerned once such nominations are made. In short, the question posed is: In an actual situation where sociometrically chosen individuals are allowed to interact with one another, within the confines of a greater group, how long does such a sociometric choice remain unchanged. Or, framing the question another way: How stable are sociometric choices.

Subjects and Procedure

Subjects for this study were eleven kindergarten children (four boys and seven girls) who were selected from a group of 41 children in the morning class of a midwestern grade school. Approximately two weeks after the class was organized each child was asked, individually, who he (or she) preferred to play with most often during the class play period. Out of the original group eleven children were found who chose an individual who was not chosen more than once by another child. These children became the experimental group. Each child then was asked why he (or she) had made the particular choice and this information was duly recorded. Six different reasons were offered for making a particular selection (e.g., being neighbors, riding the same bus to school, "looks smart," etc.). Of the eleven original sociometric nominations three were inter-sex choices while the remaining eight were intra-sex selections. And, of the three inter-sex nominations only one represented a boy choosing a girl.

Each of the sociometrically selected children was then asked (by the teacher) if he (or she) would play during the play period with the child making the choice. (Such accedence did not, however, preclude the sociometrically chosen child from concurrently playing with one or more other children!)

*Jane Srygley Mouton, Robert R. Blake and Benjamin Fruchter, "The Reliability of Sociometric Measures", *Sociometry*, Vol. XVIII, No. 1, February 1955.

Two weeks later each of the eleven children was asked to again nominate the child each would most often prefer to play with during play period. Two changes were made at this time: first, the boy who chose the girl selected a boy (the reason being "I'm the only boy playing with a girl"); and second, a boy who originally chose a boy ("because he was big and strong" but who proved to be "a toughie") selected another boy. Each successive two-week interval thereafter the group was queried as to their sociometric choices and the number of changes and reasons for such changes were noted (see Table 1).

TABLE 1

CHANGES IN SOCIOMETRIC SELECTIONS, DURING SUCCESSIVE TWO-WEEK INTERVALS (OF KINDERGARTEN CHILDREN)

Week	2	4	6	8	10	12	TOTALS (cum.) 10
Boys	2	3	3	2	0	1	11
Girls	0	3	2	0	0	0	5
Total	2	6	5	2	0	1	16

Results

Of the four boys in the group 11 changes in sociometric choices were recorded over the 10-week period, whereas the seven girls made only 5 changes in the same interval. The fourth and sixth weeks witnessed the most noticeable and turbulent changes after which period both boys and girls—more especially the girls—seemed to have stabilized their choices. A rather interesting and salient factor revealed that of the four boys one made 5 nominations, two of them made 3 different selections, while the fourth boy made no change from his original choice. Of the seven girls only one made 2 selections, three made one change in nominations, whereas three girls made no changes from their original choices. The difference between these two groups was statistically significant (CR = 3.40), indicating the boy group showed considerably more variability (less stability) in their sociometric selections than was the case with the girl group.

For the boys a total of eight various reasons for making different selections were noted, and of this total five reasons were almost identical in content. It should be pointed out here that the boy who made the greatest number of selections (5) was responsible for making four of the five identical remarks accounting for his changes in playmates. As for the girls, four reasons were cited for changing playmates, but two of these represented

girls who made original inter-sex nominations, i.e., they changed from a boy selection to a girl selection (during the 4th week). Generally, it appears that not only did the girls make less changes in playmate selections, but they also offered a lesser number and variety of causes or reasons to account for such changes.

Between the 10th and 12th weeks only one sociometric change occurred indicating that, at least for the girls, a sort of status quo had been reached. Another interesting facet showed that of the eleven changes made by the four boys not one chose another from amongst the four making such sociometric selections, while in the case of the seven girls three of the five nominations were made from amongst the nominating group.

Summary

Over a ten-week period a group of eleven kindergarten children (four boys and seven girls) were sociometrically tested, every second week, to determine the nature and extent of the stability of their nominations. A statistically significant difference appeared indicating the girls were less variable (more stable) in their sociometric nominations than were the boys. Reasons or causes given for making such changes also revealed the boys to be more variable. Therapy was indicated for one boy who was responsible for making approximately one-half of the changes in playmates.

CHANGES IN SOCIAL PERCEPTIONS CONTINGENT UPON COMPETING OR COOPERATING

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Many studies have been performed on competition and cooperation. For the most part, they have dealt with the comparative efficiency of individuals employing these techniques of behavior. The present investigation does not concern itself with comparative efficiency, but with the effects on the individual who is competing or cooperating.

The present problem is designed to investigate the effects of competing or cooperating with a group on the individual's perception of this group with regard to acceptance, rejection, or indifference. Evaluation of these perceptions is provided by the sociometric test. The use of this test as a valid, reliable and meaningful criterion of one way in which an individual perceives his group and is perceived by the group has been discussed in a previous paper. It will serve as the criterion of social perception of the investigation of the variables of competition or cooperation.

PROCEDURE

An adaptation of the sociometric test was administered to two classes of students: an experimental class (E) and a control class (C). The experimental class was subdivided into a competitive group E_1 and a cooperative group E_2. The control class was also subdivided into two groups, C_1 and C_2. Four months following the administration of the sociometric test, E_1 performed a competitive task and E_2 performed a cooperative task, while the control groups C_1 and C_2 did not perform any task. Immediately following this, the sociometric test was administered again.

It was assumed that the sets formed during the performance of the experimental tasks would carry over and be manifested in the sociometric test.

POPULATION

The author was particularly fortunate in gaining the cooperation of a school with an active vocational guidance program. It was therefore possible to obtain reasonably comparable groups. Two classes of boys in the eighth grade served as subjects. There were 39 boys in Room C and 32 boys in Room E.

The two classes were equated with regard to (a) choice of course work

and (b) religious background, and roughly with regard to (c) intelligence and (d) economic status. The students were, for the most part, 13 and 14 years of age. It was felt that they were old enough to understand and carry out the instructions and procedure, but were still not overly sophisticated or "test-wise."

Interval Between Fore and After Tests

The students in this school remained in their respective classes throughout the 10 month school year. At midterm, when they had been exposed to each other long enough to have built up an interpersonal relationship structure, the sociometric test was administered for the first time. Four months later the experimental tasks were performed and followed by the readministration of the sociometric test. The delay between fore and after sociometric tests was designed to offset the attempts of the students consciously trying to duplicate their original judgments, as in a test of memory, and also to minimize perseveration.

There was a rotation of 6 teachers for each classroom, four of whom were common to both classes. In addition the two experimental groups constituted halves of the same class. In this way social influences in the classroom which might have affected the experimental groups differentially were grossly controlled.

Adapted Sociometric Test

This test was designed so that each individual judged every other individual in terms of acceptance, rejection, or indifference. Analysis of the obtained interrelationship matrix provides measures not only of how the individual is perceived by the class, but also of how the individual perceives the class with regard to acceptance, rejection, or indifference.

Directions

Each child was given a sheet of paper. The instructor stated,

Today we want you to answer some questions. These questions are not an examination or a test, and there are no right or wrong answers. You are asked to choose which boys you like to play and work with best. This will help the school plan work and games that you will like better. *You do not have to write your name on the paper.*

The first question is: (The instructor read it, wrote it on the blackboard, read it again.) Suppose you were to move to another classroom. Which boys from this class would you (A) like very much to go with you, (B) not want to go with you, (C) doesn't matter? I am now going to read the names of the boys in this class to you, and you put the appropriate mark beside the number corresponding to his name.

Procedure and examples were illustrated on the blackboard. In this way only the numbers corresponding to the students' names appeared on the paper with the marks indicating the judgments. The names of the pupils were read in alphabetical order at 8 second intervals. The second question was presented in a similar manner.

Which boys from this class would you (A) like very much to play with during recess, (B) not want to play with during recess, (C) doesn't matter? You do not have to answer this question in the same way as the last one.

Names were read again, but in reverse alphabetical order.

Turn over your papers for the next question. Which boys from this class (A) are amongst your best friends, (B) do you not want for friends, (C) doesn't matter?

Names were then read in alphabetical order. The unsigned papers were collected keeping those of the two prechosen groups separated in each class.

This method of presentation was designed so that the judgment an individual gave on one question would not influence his judgment on the next. Many cases were found in which an individual received different judgments from the same person on the different questions.

Competitive and Cooperative Tasks

In the formulation of these tasks, competition and cooperation were considered at three levels, the procedure, the goals, and the rewards. The cooperative task involved working in groups, for a purpose which would involve the entire group, and for a group reward. The competitive task involved working alone, for individual purposes and for individual reward.

Cooperative task

Students in group E_2 were divided into groups of three and asked to work together to compose the following essay.

Are there any changes in the school procedure or policies you would like to see, as being of advantage to the student body as a whole? These changes may be of any kind, *i.e.* types of courses, methods of teaching, recreation or anything else you can think of. You may also mention and explain how any existing school practices are of advantage to the whole student body. Your essays will not be marked and your names do not have to be written on the paper.

Competitive

I want you to write an essay advising any changes in the school procedure or policy which would be of advantage to you personally. These changes may be of any kind, *i.e.* types of courses, methods of teaching,

recreation or any other you can think of. You may also mention and explain how any existing school practices have been of advantage to you. This essay will count toward your final work in composition. Put your names on the papers.

After 40 minutes at these tasks, the sociometric test was readministered.

Results

In Table 1 the percentages of A (acceptance), B (rejection), and C (indifference) judgments *given* and *received* by each half of both classes are presented.

It can readily be seen that there were considerable differences in sociometric distribution in these groups. On the fore test, the experimental class (E) demonstrated a more favorable distribution of scores than did the control class (C). (By a more favorable distribution is meant a greater number of acceptances and lower number of rejections and indifference judgments.) The cooperative group E_2 of the experimental class received more favorable judgments than the competitive group E_1, while giving less favorable judgments.

The values of t obtained for the mean differences between fore and after sociometric tests are also presented in Table 1. Since the judgments each individual received were known, but the judgments he gave were not known, it was necessary to use the formula for computing t which is based on the assumption of independent groups. This procedure would tend to lower the values of t and hence the presented values underestimate the actual t's.

No significant changes between fore and after tests were noted in the control groups C_1 and C_2.

Analysis of scores *given* in Room E demonstrated a more favorable sociometric distribution given on the after test than on the fore test by both experimental groups. These changes were significant in the cooperative group but not in the competitive group. It should be noted that the competitive group originally manifested a higher level of acceptance and had less room to expand. Nevertheless, on the after test, the level of acceptance in E_2 surpassed that found in E_1.

Analysis of scores received in class E demonstrates that a more favorable distribution of judgments was received on the after test than on the fore test. These changes were all significant except for the difference in rejections in the competitive group, which did, however, show some decrease.

TABLE 1
COMPARISON OF SOCIOMETRIC DISTRIBUTIONS

Group	Type of judgment	Mean judgments given[1] Fore test	After test	t	Mean judgments received[1] Fore test	After test	t
E_1	A	69.4	73.1	0.4	47.9	68.5	4.0**
	B	5.9	5.2	0.2	12.4	8.0	1.4
	C	24.7	21.7	0.4	39.7	23.5	5.2**
E_2	A	43.6	76.9	6.5**	66.8	81.9	3.5**
	B	12.0	4.5	2.8**	5.1	1.6	2.7*
	C	44.4	18.6	4.5**	28.1	16.5	3.4**
C_1	A	40.7	34.5	1.2	33.1	29.7	1.7
	B	24.3	23.8	0.2	27.5	26.4	1.0
	C	35.0	41.7	1.4	39.4	43.9	0.0
C_2	A	27.7	33.9	1.1	36.6	39.6	0.3
	B	26.0	20.1	1.3	22.3	17.2	1.4
	C	46.3	46.0	0.02	41.1	43.2	0.8

[1] Group mean judgments are expressed in percentages.

DISCUSSION OF RESULTS

It has been shown that individuals became more accepting of the group and perceived this group in a more favorable light after having performed a cooperative task. This was not found to be the case in either the control or competitive groups.

The judgments received by the competitive group after the performance of the tasks were significantly more favorable, although the judgments they gave were not greatly changed from fore to after tests. Hence, it follows that additional favorable judgments must have derived from the cooperative group. Thus, the cooperative group were not merely more accepting of the individuals with whom they cooperated, but were more accepting in general. This suggests that cooperative group effort (socialization) does not necessarily engender frustration and aggression, but on the contrary renders the individual more accepting in his social perceptions.

SUMMARY

An adaptation of the sociometric test was administered to three groups of eighth grade students. In this test each individual judged all the members of the group with regard to acceptance, rejection, or indifference. After a period of time one group participated in a competitive task, one group in

a cooperative task, and a control group did not participate in either task. The competitive and cooperative groups were taken from the same classroom. Immediately after these tasks, the sociometric test was readministered.

A reciprocal analysis of the data provided measures not only of how the individuals were perceived by the group, but also how the individuals perceived the group.

There were no significant changes in the choices given by the control and competitive groups. The cooperative task group perceived the members of the class they cooperated with, as well as the other members of the class who were in the competitive group, in a significantly more favorable light.

This study is one example of the application of the sociometric technique to a problem in experimental social psychology in which it serves as a valid, reliable and meaningful criterion of one way in which an individual perceives the group.

A STUDY OF THE EFFECTS OF CONFLICTING SUGGESTIONS UPON JUDGMENTS IN THE AUTOKINETIC SITUATION*

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Most studies involving prestige suggestion to date have dealt with shifts in judgments or perceptions relative to those of an introduced prestige source. It must be recognized, however, that in everyday life one faces situations wherein a choice or judgment is required and the various relevant prestige figures or group norms are in conflict or are in contradiction to each other. There does not appear to be much research into what happens when the individual must make judgments in the face of a conflict between equally prestige-laden norms. This is essentially the question posed by Murphy, Murphy and Newcomb (3, p. 971). They ask what happens when the average, normally involved person is cast into a situation wherein he must make a decision, a judgment, in the face of conflict or contradiction among the presumably equipotent anchorage points.

There is yet another aspect of judgment situations which may be dealt with by a slight elaboration of the experimental situation. The type of situation referred to is that in which individuals are required to make judgments in the face of discredited anchorage points. The attempt shall be made to ascertain the type of judgments (in terms of direction and degree) a person or persons will make when one has destroyed the significance of the relationships between the judgments and the prestige figures. Stated in the form of a question, it has been asked, "What happens to individual judgments when the existing external anchorages have been discredited?"

Hypotheses:

In Sherif's 1935 study (4) he reports that in a series of individual experiments, "once a range, and a point of reference within that range, is established by an individual, there is a tendency to preserve these in the experiments on the subsequent days." Sherif had his subjects make a series

* The author would like to acknowledge his indebtedness to Professor Muzafer Sherif for his unfailing support of this research project as well as his able direction and also the Office of Naval Research for their financial support administered through the Research Institute of the University of Oklahoma. This study was submitted as a doctoral dissertation to the Graduate Faculty of the University of Oklahoma. The full text is on file in the University Library.

** Now at Northwestern University.

of 400 judgments over a period of four sessions and he found that the median values for each session tended to remain similar to those in the first session while the variability tended to be reduced. In the present experiment these findings receive a repeated check. Stating this finding in the form of an hypothesis to be tested: When the individual is repeatedly called upon to judge the amount of apparent movement he will ordinarily tend to maintain the same norm and reduce the variability of his judgments.

The second hypothesis being tested is that a suggestion which is reasonable, that is, within the limits of the subject's perceptual range, will serve as an anchorage and thereby cause a shift in norms and a reduction of variability.

The third hypothesis being tested is that a suggestion attributed to a source equally as good as a previous source of suggestion, but *opposite in direction to the former suggestion,* will create a conflict situation for the individual reflected by a rise in variability of judgments along with a shift in norms.

The fourth hypothesis being tested is that the discrediting of anchorage points will result in a relative rise in variability.

Within the theoretical framework in which this research is cast, it should be mentioned that it is believed that heightened variability reflects increased instability of the norms. In this regard then, there is the further hypothesis that associated with shifts in norms will be changes in variability.

Experimental Design:

Twenty-five college students were utilized in an experiment which required them to expose themselves to the autokinetic situation on four separate occasions. Fifteen of the subjects were placed in the experimental group, ten were placed in the control group. Previous to being introduced to the "judgment of movement" situation, the experimental group subjects had been called upon to express themselves on a questionnaire designed to enable the experimenter to ascertain which two academic institutions the subject held in the highest esteem, that is, which two schools commanded a great deal of prestige in the eyes of the particular subject. The subjects did not know that there was any connection between the questionnaire and the subsequent experimental procedure. The questionnaire was usually administered at least a week before they were introduced to the autokinetic situation.

The first laboratory session was the same for all subjects. They were

called upon to judge the distance through which they perceived a point of light to move; thirty-five successive judgments were recorded for each session.

For the subjects comprising the control group, all four sessions were the same; the subjects received no information of any kind alluding to the judgments. For both groups, each session was held from three to four days apart.

For the experimental group the second session was like the first, with the exception that just previous to arriving at the laboratory, the subject was casually informed of the distance judgments attributed to students like himself who were said to be attending one of the two schools which the subject had ranked at the top of the list in the questionnaire. The distance judgments were fictitious and were dependent upon the subject's own range of judgments made in the first session. The median value of the suggested judgments was a value representing either the 10th or 90th percentile distance value given by the subject in the first session.

The third session was similar to the second session except that this time the subject in the experimental group received the information shortly before the experiment that at the second high-prestige level school, as indicated on his questionnaire, the students in his major area of interest were judging the movements differently from those at the first mentioned institution. The median value of the second suggested range of judgments was either the 90th or 10th percentile value obtained from said subject in session I. In other words, the second suggestion was opposite in direction from the first suggestion, and it was attributed to an equally high prestige source. Just previous to the fourth session the subject was made aware of the "fact" that both of the previously mentioned schools had informed the experimenter that their reported results were in error. The errors were attributed to either equipment failure or mistreatment of the data, excuses which the subjects readily accepted. The subjects were also told that these institutions were going to have the experiments re-run in order to get data in this area. It was felt that this type of information would operate to eliminate the effectiveness of either of the suggestions as anchorages.

Results:

The judgments of distances through which the subjects perceived the light to move constituted the raw data of the experiment. The analysis is designed to reveal the number of shifts in norms (central tendency) from session to session in each group. An analysis was also undertaken to ascer-

tain the number of significant changes in variability that had taken place from session to session in each group. A third treatment indicated the comparative levels of variability for each session in each group, while still another treatment indicated the number and percentage of the intersessional comparisons which showed significant variability changes, significant shifts in norms, and significant changes in variability concomitant with significant shifts in norms. There is also an indication of the number of intersessional comparisons that indicated no significant changes of any kind.

The technique used for determining the significance of shifts in norms (median shifts) is the one suggested in Moses' (2) article on non-parametric statistics. The test is called the *Median Test* (p. 125). For each individual, comparisons were made between the judgments in Sessions I and II, II and III, III and IV, I and III, II and IV, and I and IV. The test is used to determine whether a particular one of two populations has a larger or smaller median value than the other. What is necessary is to combine into one distribution the judgments of the two situations being compared and then ascertain the median value for the combined distribution. If the samples come from populations with the same median value, then we should expect about half of the values from *each* session to be above the common median and half to be below the common median. If the relative proportions are too divergent from this expectation, the hypothesis of equality is rejected. All that is required for this test is that a 2 x 2 contingency table be constructed for each type of comparison mentioned above. Consequently, six chi-square tests were run for each subject making each of the possible comparisons between four situations compared two at a time.

Changes in variability from session to session in each group were evaluated using the *F* test as described by Lindquist (1, p. 60 *ff.*). A chi-square test was utilized for determining the significance of the numbers and percentages of various combinations of changes and lack of changes.

1. Sherif's finding in his 1935 study regarding the tendency for repetition in the autokinetic situation to result in the maintenance of a personally evolved norm with a gradual reduction in the variability has been corroborated. (See Tables 1 and 2.) The control group exhibited a drop in variability from session I to session IV which is significant at better than the .01 level of confidence. (See Table 2.)

2. It was found that a suggested norm which was associated with a source of relatively high prestige value produced a large number of significant shifts in median values relative to the control sample. Eighty per cent of the cases in the experimental group showed significant norm changes from the

TABLE 1

A Summary of the Number of Significant (below 5% level of confidence) Changes in Central Tendency (median shifts) and Shifts in Variability Including the Percentages of Responses Exhibiting the Shifts

Experimental group Sessions—	1 & 2	2 & 3	3 & 4	% CC*	1 & 3	2 & 4	1 & 4	Tot. No.	% Tot.**
Cent. tend. shifts	12	9	10	*69*	6	11	10	*58*	*64*
Variab. shifts	9	8	8	*56*	8	8	9	*50*	*56*
Control group									
Cent. tend. shifts	1	3	2	*20*	3	3	3	*15*	*25*
Variab. shifts	4	2	2	*27*	4	3	6	*21*	*35*

* Percent of the cases of contiguous comparisons showing significant shifts.
** Percent of the total comparisons showing significant shifts.

TABLE 2

Comparison of Variability: The Mean Sums of Squared Deviations for the Four Situations within Each of the Two Groups for Significance of the Obtained Differences

Situation	Experimental Mean Square Deviation		Situation	Control Mean Square Deviation	
I	772.3094		I	236.7986	
II	232.2420		II	154.1458	
III	333.0829		III	149.6086	
IV	407.9191		IV	97.5499	
	Significance of Differences				
Comparisons	F.	p	Comparisons	F.	p
I & II	3.3255	<.01	I & II	1.5362	>.05
I & III	2.3187	<.01	I & III	1.5828	>.05
I & IV	1.8933	<.05	I & IV	2.4275	<.01
II & III	1.4342	>.05	II & III	1.0303	>.05
II & IV	7.7564 app.	.05	II & IV	1.5802	>.05
III & IV	1.2247	>.05	III & IV	1.5337	>.05

first session to the second as compared with only 10% such changes occurring in the control group. (See Table 1.)

The suggestion of a norm also caused a reduction in variability in the second session of the experimental group. The reduction of variability in session II as compared to session I was significant at below the .01 level of confidence. Session II of the experimental group exhibited the lowest degree of variability for any session in that group. It was found too, that the

reduction in variability following the introduction of a suggested norm was greater than the reduction which took place in the control group for the comparable session. (See Table 2.)

3. *Session III, the conflict session in the experimental group, reflected a sharp rise in variability which is particularly noteworthy in light of the fact that in the control group the variability for the third session tended to stay the same as it had been in the second session.* (See Table 2.) In the conflict situation there were again a relatively large number of shifts in central tendency accompanying the heightened variability. The higher variability has been interpreted as being indicative of a relatively low degree of organization of the individual's system of anchorages. The level of organization, however, seems to be better than that in the first situation in which the individual is completely new in the situation.

4. When the objective value of the conflicting anchorage points was destroyed the results indicated a rise in variability relative to the third session. The fourth session of the experimental group which reflects the disavowal of the previous suggestions tends to produce a rise in variability to a point where it is just barely significantly less than what it was in the first situation. (See Table 2.)

5. It was found that the largest percentage of situational differences involved changes in central tendency concomitant with significant shifts in variability. It was further noted that when potential anchorages are in the picture, as in the experimental group, then variability changes are more likely to be accompanied by changes in central tendency than are changes in central tendency likely to be accompanied by changes in variability. In the control group the converse seemed to obtain. Variability changes were more prevalent than norm changes when internal factors were the only ones present. Norm changes were more prevalent than variability shifts when interposed anchorages were involved. (See Table 3.)

In answer to the first question raised at the beginning, namely, "What happens when an individual is cast into a situation wherein he must make a decision in the face of conflicting or contradictory anchorages?" the following has been observed.

Most individuals evolve a norm different from the norm evolved in response to the first interposed anchorage or suggestion but the stability of this norm is not as great as the stability of the norm evolved in the nonconflict suggestion situation. The variability in session III in the experimental group shows a notable increase over the variability in session II. This receives added emphasis in light of what occurs in the control group.

TABLE 3

A Summary of the Numbers and Percentages of Various Combinations of Changes and Lack of Changes

Pattern of Changes	Control Group Comparisons				Experimental Group			
	Contiguous	Non-con.	Tot. No.	% of G.T.	Comparisons Con.	Non-C	Tot. No.	% of G.T.
Norm shifts accomp. by variability shifts.	2	4	6	10	19	17	36	40
Norm shifts not accomp. by variab. shifts.	4	5	9	15	12	10	22	24.4
Variability shifts not accomp. by norm shifts.	6	9	15	25	6	8	14	15.5
Comparisons showing no shifts of any kind.	18	12	30	50	8	10	18	20

The third session in the control group reflects a slight decrease in variability from that of session II.

The second suggested norm is sometimes adhered to, but more often it appears that the individual will stay in the region of the first suggested norm or move to a point somewhere between the two suggestions, a point in the region of the norm evolved in the pre-suggestion situation.

In answer to the second question ("What happens to individual judgments when the external anchorages have been discredited?") it was noted that the variability increased above the level wherein there was a conflict in two still credible anchorages. For the most part, the norms evolved tended to remain somewhere between the norms which had been evolved following suggestions but this was not true in all cases. Some individuals evolved norms in situation IV that were beyond the norms of situations II and III.

Summary:

Many studies involving prestige suggestions have dealt with shifts in judgments or perceptions relative to those of an introduced prestige source.

In everyday life one faces situations wherein a choice or judgment is necessary but where the judgments of various relevant prestige figures or the norms of relevant groups are in conflict. Another condition for judgment in everyday life is that in which one must make judgments in the face of discredited anchorage points. The present study attempts to evaluate the effects of these two situations.

The following hypotheses were tested:

(1) If no external factors are introduced from situation to situation, judgments of amount of apparent movement in the autokinetic situation will tend to cluster around the same norm and variability of judgment will be reduced.

(2) The introduction of a suggestion from a prestige source will cause a shift in norms and a reduction of variability.

(3) The introduction of a suggestion from a source equally as good as the prior source but in the direction opposite to that previous suggestion will create a conflict situation reflected in a rise in variability along with a shift in norms.

(4) Discrediting both of the experimentally introduced anchorage points will result in a relative rise in variability of judgments.

Prior to the experimental sessions and apparently unrelated to them, fifteen subjects responded to a questionnaire designed to discover which two institutions of higher learning had high prestige in the eyes of the particular subject.

All subjects participated in 4 sessions 3-4 days apart, making 35 successive judgments of extent of autokinetic movement in each session. Control subjects received no information of any kind alluding to the experiment.

Just prior to session II, subjects in the experimental group were given information regarding the judgments of students like them said to be at one of the two institutions which the subject in question ranked highest. Prior to session III, information concerning the judgments of students at a second school rated high in prestige was introduced. These introduced judgments were opposite in direction to those given in session II. Prior to the final session (IV), experimental subjects learned that the previously mentioned schools had made errors in reporting their results.

It was found that:

(1) The first hypothesis was fully supported; control subjects receiving no experimental anchorages exhibited a significant decrease in variability from sessions I to IV with a tendency to maintain the same norms.

(2) The introduction of a suggested norm from a prestige source produced significant shifts in norms relative to the control group and a significant reduction in variability from session I to session II in the experimental group.

(3) The conflict session (III) produced a sharp rise in variability with a relatively large number of shifts in central tendency (norms) accompanying it.

(4) When the conflicting anchorage points were discredited (session IV), the results indicate a rise in variability relative to session III.

It was found further that the largest percentage of situational differences involved changes in central tendency (norms) concomitant with significant shifts in variability. When internal factors were operating without the introduction of experimental anchorages, as in the control group, significant variability changes were more common than norm changes.

When interposed anchorages were involved, as in the experimental group, norm changes were more prevalent than variability shifts.

This research is presented as an experimental contribution applying "frame of reference" theory to the understanding of the effects of conflicting prestige factors so prevalent at present in life situations.

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SOCIOMETRIC RELATIONS IN ELEMENTARY SCHOOL CLASSES

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In a recent volume[1] Ingvar Johannesson has published his results from a series of intensive studies of social relations between children in Swedish elementary school classes.

When Johannesson started his investigations in 1943, he knew nothing about Moreno and the sociometric movement. His methodological and conceptual starting-point was taken from the most important Finnish investigation of social life in a school class, *viz.* Koskenniemi's "Soziale Gebilde und Prozesse in der Schulklasse" (Helsinki 1936). Koskenniemi, in his turn, had been inspired by the Vienna School; by Reininger, Hetzer, Večerca, and Elsa Köhler and their work in the twenties and early thirties. One of their many methods of research was the so-called *ranking experiment,* requiring the pupils to write the names of their classmates in the order of their suitability as leaders. This method, called by Johannesson the *hierarchical experiment,* seems to have been introduced by David Katz in Rostock in order to replicate among humans certain ideas in Schjelderup-Ebbe's famous "peck-order" experiment.—Koskenniemi's thesis of 1936 being Johannesson's earlier main source of inspiration, Moreno's monograph of 1934 was the later but even more important one. Although other authors, such as e.g. Päivänsalo, have used the Moreno technique and the Katz ranking technique side by side—which *in facto* but not *in nomine* already Koskenniemi did—it must be stated that the present writer has nowhere found such a thoroughgoing comparison between these methods as in Johannesson's book, this certainly being one of its most important contributions to social psychology.

Johannesson meets us as the typical empiricist: we have to compliment him for his reluctance to lose the individual nuances in the too meagre statistical symbol, his effort to alternate between concrete illustration and tabular survey, and for his willingness to keep close to his raw data in the terminological description (thus for example, he does not talk about socially adjusted and socially maladjusted individuals, but about positively and

[1] Johannesson, I., *Studier av sociala relationer mellan barn i folkskoleklasser.* (In Swedish. With an English summary: Studies in social relations between children in elementary school classes). Pp. 341. Lund: Gleerup, 1954.

negatively overchosen).[2] The advantages of this attitude are obvious to everybody; the disadvantages are not too annoying. As one disadvantage could otherwise perhaps be mentioned a certain lack of concentration—we find some unnecessary tabulations of raw data, some unnecessary diagrams and we have a general impression that the book could have been written considerably shorter. Another disadvantage may perhaps be seen in the reference list. Among the very impressive list of about 225 works two kinds of literature could perhaps have been given more attention: (a) theoretical papers with attempts to give the empirical data a wider *general* frame of reference; and (b) papers which try to analyze the individual's perceptions of their own and other people's sociometric status and thus give the sociometric data a wider *psychological* frame of reference. The analysis of temporal variability, for example, could perhaps have been made more interesting if seen also from the point of view of a field-dynamical theorizer. Similarly, the discussion of self-evaluation might have been favorably supplemented by references to "perceptual sociometry" from Moreno's discussion in 1942 to Tagiuri's and Bruner's more recent contributions.

Most results from this Swedish investigation confirm the results from the American, German, and Finnish studies and are important as confirmatory material. With a three-year follow-up study of five school classes (10 to 13 years) Johannesson had unusual possibilities to investigate the developmental aspect of social life.

The principal problems of his investigation were: (a) an investigation of the general social relations in school classes partly with the aid of the Moreno technique for choosing bench-fellows, workmates, playmates etc. (which is termed "social distance"), partly with the aid of the ranking technique for evaluating classmates in the order of their suitability as leaders (which is termed "social position"); (b) an investigation of the correspondence between these two main categories of relational variables; and (c) an investigation of the relationship between these variables on the one hand and certain extra-relational variables, such as intelligence, school reports, and the economic situation of the family, on the other.

Some results may be cited.—The positive choices made and obtained tend to form a distribution positively skewed, and the negative choices (rejec-

[2] Johannesson uses the terms positively and negatively supercrined. The commentator would prefer not to use such Graeco-Latin hybrids but speak of positively and negatively superselected (or—if we want to avoid two-word characteristics—of superselected and superrejected).

tions) tend to give typical J-distributions. Johannesson could confirm Moreno's reports about a socio-dynamic effect: the concentration of choices on a few individuals seemed, however, to be more apparent in the case of more specialized and sociotelic choice aspects (choice criteria) than in the case of more general and psychetelic ones.—The pupils who choose each other mutually in the sociometric tests were also to a considerable extent together in the school playground, which is an important finding for the purpose of predicting from the specific sociometric to other more general social preference situations.—The number of choices obtained by pupils in the Moreno type situations showed an important degree of stability, most correlations falling between .70 and .80 with intervals of some months and remaining about .50 even at intervals of two years or more. Although percentage calculations show only moderate correspondence between single choice-directions, most pupils thus receive a fairly similar sociometric status in a new test. In the same way, as a rule drastic revisions of the rank of precedence in the leader-preference situations do not happen.

The pupils who received a large number of choices in one choice aspect usually obtain a high preference status with respect to other aspects, too. Thus, there is not only a high correlation between two clearly subjectivity-disposing aspects such as playmates and friends (.70 to .85), but also between such an aspect and a somewhat more intersubjectivity-disposing aspect (playmates/workmates .60 to .80).—However, when we turn to the correlations between leader choices on the one hand and group member choices of different kinds on the other hand—which as already stated is one of the principal problems of the book—we are confused by disturbing factors. Everywhere in these comparisons we have to calculate not only with differences in choice aspects (choice criteria, "what to choose": leader *vs.* e.g. bench fellow) but also with the unfortunate additional differences in choice method ("how to choose": forced preference ranking of the whole class *vs.* the ordinary Moreno technique). Obviously the results would have been much less obscure than they are now if the same method had been used in both cases (whereby it seems to be of relatively little importance *which* method to use). Being inspired by two different research traditions, Johannesson seems to have taken over their methods without sufficiently adapting them to his own problem; although the historical connections linking leader preferences with the ranking method in Germany and Finland and the workmate or playmate preferences with the ordinary Moreno technique in the USA are clear, there appears to be no *logical necessity* behind this. It is here explicitly hoped that Johannesson himself and/or other workers in

this field will undertake a replication of these experiments making the necessary modifications (e.g. holding the choice-method constant).

Taking the results concerning choice aspects as they are, we may conclude that we obtain very similar results with different aspects when we deal with children in this age and even that different aspects *together with* different choice methods do not make the correlations insignificant.—This similarity seems to be founded on a certain acceptance by the pupils of the more objective school achievement rank, which is seen from the rather remarkable correspondence between the teacher's estimation in marking and the pupils' choice attitudes. Even measured more objectively with intelligence tests, the most chosen pupils are as a rule seen to be children of good intellectual capacity. This correspondence between achievement status and peer acceptation status (or, if we prefer to say so, between teacher-evaluation and peer-evaluation) is of course greater in the case of leadership and work-mate choices than in the most subjectivity-disposing aspects such as "playmates."—The assessed yearly income of the family did not seem to have any significant influence on the social position of the pupils in a class. What are determining factors in the social structure of the class are, of course, due among other things to the teacher atmosphere and the social class structure of the surrounding community. Perhaps we will obtain other results from other types of communities and other types of instructors, adding to our growing insight into the dynamics of the school-class world.

Due to the methodological broadness, the empirical approach and the modest attitude of Johannesson, as a rule we find cautious and well-founded conclusions. However, there are some exceptions, due to one of the following two factors: (a) a disregard of disturbing factors as, e.g., when the author changes more than one factor at the time in methodological or other comparisons (one important example is already given); and (b) a certain carelessness in ocular analysis of some diagrams and tables. Combined with these errors there is sometimes a tendency to somewhat too hasty a translation from the rather limited population (one girls' class, two boys' classes, and two mixed classes from three South Swedish communities) or even from only a part of it to the very general field of "girls" and "boys."

Invariance with respect to population, instructions, and situational factors is not always found.—It is to be regretted that the author could not follow all five classes through the same age stages, which would have made the comparisons easier. As it is now, one class has older children than the other four.—The author uses a 3-choice limit in one group of choice aspects (R) and a 4-choice limit in another choice aspect (O), which prevents

clear conclusions not only concerning the inter-aspectal differences but also concerning the importance of the choice limit.—The intervals between the retest seem sometimes to be confusingly different.—When the author tries to compare one boys' class and one girls' class with two mixed classes, but takes these classes from dissimilar communities, he has brought in an unnecessary disturbing factor.—Another disturbing factor may in some cases be the half-way realization of choices, which is apparent from the discussion of orientation-mates. At the first choice situation there were several intersexual choices. Whereas the teachers tried to satisfy the choices as a general principle, intersexual choices were not satisfied. At later choice situations these intersexual choices had disappeared. The author concludes: If the wishes the pupils have expressed in the sociometric choices are not realized, this fact seems to influence highly the result of the following tests. This general statement may be right, but it does not necessarily follow from the case cited. Here we deal with a half-way realization. Had no choices been realized, the intersexual choices would perhaps have remained unchanged. As a rule all choices cannot be carried out. Therefore this nonobservation of the dangers of half-way realization may have influenced many temporal investigations in a nonpredictable way, and as the reader is left without information as to the principles of realization as well as of the percentages of realization and non-realization, he has no possibility to make any estimate of these complications.

The "readability" of different types of sociograms is discussed, but in the analysis of some of his own sociograms Johannesson is not sufficiently cautious (p. 124 et seq.). These conclusions about single classes are however not too important. More unfortunate are perhaps certain more general statements drawn from other diagrams and from tabular surveys. The author seems to have a tendency rather to look at graphical curves than to estimate statistically the differences between them and rather to estimate intuitively series of correlations than applying conventional statistical tests of difference. Some illustrations of careless reading are given here. If "truth" is defined for this purpose as "consistent with the empirical data given in tables and diagrams in this book," it is, for example, not "true": (a) that the over-estimation tendency is more marked among boys than among girls (p. 246; in fact, according to the diagrams we find a very clear *opposite* tendency); (b) that the agreement with reference to the low-ranked persons grows increasingly greater (p. 325; at least, it is not true, if the standard deviation is taken as starting point); (c) that, with reference to the self-appreciation, the opinions grow increasingly realistic (p. 326). Some of these

statements are to be found in the summary, and there may be some danger that they are accepted without examination at least by readers who lack knowledge of Swedish.

Sometimes the logic in drawing the conclusions may be questioned. The author shows that in calculating choices with the aid of a scale of points, in which the first choice is awarded 5 points, the second 4, etc., we obtain a higher correlation between limited and unlimited choices than when differential weighting is not used. From this demonstration the author draws the conclusion that the use of a point scale is highly motivated (p. 108). However, the fact of greater agreement in the case of a point scale is *a priori* obvious, as the numbers compared in limited and unlimited choice-situations will be more similar with a point scale due to the heavy weighting of the first choice-levels. This fact does not say anything about the point scale as a better expression for the status of the individual. In such a demonstration he has to use an outside criterion. Why not try to compare the different calculational methods with a criterion measure of status, e.g. status inferred from contact observations, or the hypothetical status concluded from the individual's position in determinating variables, such as intelligence, school marks etc.?

As we have seen, some criticism may be directed against particulars in this work. Nevertheless, the investigation seems to represent very important reading for everyone interested in this field. The obscure points constitute only a very small part of the comprehensive book; many good points have been stressed, and more could have been stressed were it not for the lack of space in a review like this. Its methodological broadness and flexibility (being influenced both by European and American methodologists) is unique in this field and Johannesson's longitudinal analyses of single classes or single individuals seem to represent a fruitful approach. The careful reader of this 341 page work with its 135 tables and 78 diagrams will return from the reading not only with a profound admiration for the immense work done by the author but also with many fresh suggestions for further research.

CHANCE EXPECTANCY AND INTERGROUP CHOICE

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A. INTRODUCTION

In their joint article, Moreno and Jennings (1) suggested that the consecutive terms of the Bernoulli series will yield the likelihood of an individual receiving 0,1,2 . . . N-1 choices. They had assumed a population, N, and a number, d, limiting the choice output of each member of the population.

Urie Bronfenbrenner (2) proposed several approximations to facilitate the computation of the terms of the $(q + p)^n$ series; of these approximations, the one employing Pearson's Type III Function has been found useful especially as Salvosa (3) tabulated the respective probability values for the function.

The distribution of mutual choices—the expectancy that there will be 0,1,2, . . $N^2 - N/2$ mutualities—was similarly discussed by Bronfenbrenner (2), but the deficiencies of the approach were clearly observed by Edwards (4) and Criswell (5).

The problem of expectancy of 0,1,2 . . . k isolates (persons not chosen by anyone) has been solved by Katz (6) who also offered an approximation which minimizes computational work.

Paul H. Maucorps (7) following Schuetzenberger (8) came forth with formulae for the expected numbers of triangles and squares; but not until the studies by Katz and Olkin (9) has the more general problem of expected k-chains (k-paths, k-rings, k-cliques) been solved.

Contrasted with these advances, little attention has been paid to intergroup choice processes. The Criswell ratio (10), of course, gives the expected proportion of all choices that should be received by a subgroup of a larger population. And it was Edwards (4) who outlined the possibility of using the multinomial distribution in evaluating the probabilities that 0,1,2 . . . . choices will be made by subgroup members into another subgroup.

It will be the purpose of this paper to explore more fully the properties of this multinomial, and to devise operational procedures for obtaining intergroup choice probabilities.

B. Assumptions

We shall assume a population of size N. Next, we shall dichotomize this population along some analytically meaningful lines (such as sex-division, White-Negro) into a subgroup A, and a subgroup B, so that

(Eq. 1) $$A + B - N.$$

The membership in subgroups A and B must be nonoverlapping, that is, there exists no individual who would be simultaneously member of both A and B.

Finally, we restrict the number of choices each individual can make, and define this number as d.

C. Individual Choices

Let N be the size of the population which is divided into a subgroup A, composed of a members, and subgroup B, consisting of b members.

Each member of subgroup A then may allocate his d choices only to other members of A, (a-1) in number. Or he may allocate (d-1) of his choice to the (a-1) members of A; or, (d-2) of his choices to other members of A, and so on. The remaining choices will be made into subgroup B.

I. What is the probability that an individual, any member of subgroup A, a_1, make no choices into subgroup B?

(Eq. 2) $$p_0 = \frac{\binom{a-1}{d}}{\binom{N-1}{d}}$$

where the $\binom{n}{x}$ terms are combinations, or the numbers of ways in which x elements can be selected out of a class consisting of n elements, hence

(Eq. 3) $$\binom{n}{x} = \frac{n\,!}{(n-x)\,!\,x\,!}.$$

(a) the d choices available to our individual, a_j can be allocated altogether in as many ways as d elements can be selected from among (N-1) elements, thus $\binom{N-1}{d}$.

(b) the desired attribute (absence of choice made into subgroup B) in as many of these cases and d choices can be made into subgroup A, or $\binom{a-1}{d}$.

II. What is the probability that an individual, a_1, make one of his d choices into subgroup B?

(Eq. 4)
$$\frac{\binom{b}{1}\binom{a-1}{d-1}}{\binom{N-1}{d}}$$

(a) for this event, p_1 to happen, (d-1) choices must be made into the population of (a-1) members of subgroup A.

(b) the remaining d-th choice must be made into the subgroup B,

(c) and it can be made to any individual in subgroup B; this member can be selected in $\binom{b}{1}$ ways.

III. What is the probability that individual a_1 make two of his d choices into the subgroup B?

(Eq. 5)
$$p_2 = \frac{\binom{b}{2}\binom{a-1}{d-2}}{\binom{N-1}{d}}.$$

(a) for the event implies that (d-2) choices be made to other members of A, (a-1) in number,

(b) and the two remaining choices must be made into subgroup B.

(c) There are $\binom{b}{2}$ ways in which these two members can be selected from among the b members.

IV. What is the probability that individual a_1 make r of his d choices into the subgroup B, provided that $r \leqslant d$?

(Eq. 6)
$$p_r = \frac{\binom{b}{r}\binom{a-1}{d-r}}{\binom{N-1}{d}}.$$

(a) if $r = 0$, the $\binom{b}{r}$. is equal to 1—and the result is (Eq. 2).

(b) if $r = d$, the $\binom{a-1}{r}$ term is equal to 1, and the result becomes

(Eq. 7)
$$p_d = \frac{\binom{b}{d}}{\binom{N-1}{d}}.$$

D. Intergroup Choosing

We may now sum up our conclusions up to this point: (1) we have a subgroup A with a members in it and a subgroup B with b members in it, (2) and the two subgroups form our analytic population N. (3) Each individual is permitted to make up to d choices. (4) There exists a probability, p_0, that any members of A make no choice into subgroup B, and a probability, p_1, that he make one choice; or in general, a probability, p_r, that a_j make r choices into subgroup B, provided that $r \leqslant d$.

There are a members in A, each allocating d choices (at most). What is the probability that all the A's, having chosen, make 0,1,2 . . . . da choices into subgroup B?

The probability that members of A make exactly t choices into the population B corresponds exactly to the coefficients of x^t in the following combinatorial generating function:

$$(p_0 + p_1x + p_2x^2 + \ldots . + p_dx^d)^a.$$

We can see that, at most, d.a choices can be made by A's into subgroup B: this event would occur of all the members of A allocated all their choices, d each, to members of B.

We shall now suggest a procedure for evaluating this function so that we may obtain the probabilities that A's make 0,1,2,3 . . . da choices to the B's.

I. What is the probability that all members of A make no choice into the subgroup B?

(Eq. 8) $$P(A\text{-}B)_0 = p_0^a.$$

(a) We found, by Equation 2, the probability that any individual, a_i, make no choice to members of B, to be p_0.

(b) By the law of joint probabilities, the required expectancy is the product of the independent probabilities, or, as in our case, p_0 multiplied by itself a-times.

II. What is the probability that all members of A make exactly one choice into subgroup B?

(Eq. 9) $$P(A\text{-}B)_1 = p_0^{a-1}\, p_1 \binom{a}{1}.$$

(a) our condition is satisfied when, and only when, (a-1) members of A make no choice to B's (p_0^{a-1}).

(b) and the remaining member makes one choice (p_1 by Equation 4).

(c) But this can be anyone of the a members, and one individual can be selected in $\binom{a}{1} = a$ ways.

III. What is the probability that all members of A make two choices into subgroup B?

(Eq. 10) $$P(A\text{-}B)_2 = p_0^{a-2} p_1^2 \binom{2}{2} + p_0^{a-1} p_2 \binom{a}{1}$$

(a) The event $P(A\text{-}B)_2$ consists of two component subevents.

(b) First, (a-2) members of A make no choice to B's, and two different members of A make one choice each $\binom{p_1^2}{}$

(c) and these two individuals can be selected in $\binom{a}{2}$ ways.

(d) Secondly, (a-1) members of A make no choice to subgroup B, but one member of A chooses two members of B—an event which has a probability p_2 (as per Equation 5).

(e) This individual can be then selected in $\binom{a}{1}$ ways.

IV. What is the probability that all members of A make three choices into subgroup B?

(Eq. 11) $$P(A\text{-}B)_3 = p_0^{a-3} p_1^3 \binom{a}{3} + p_0^{a-2} p_1 p_2 \frac{a!}{(a\text{-}1\text{-}1)!\,1!\,1!} + p_0^{a-1} p_3 \binom{a}{1}.$$

(a) Three subevents now compose the total event $P(A\text{-}B)_3$.

(b) Subevent I: (a-3) individuals make no choices into subgroup B; and three different individuals make one choice each; with the three individuals being selected in $\binom{a}{3}$ ways.

(c) Subevent II: (a-2) individuals make no choice into subgroup B; one individual makes one choice, and another individual makes two choices to B's.

The subevent can happen in as many ways as the subgroup population a can be divided into three groups, one consisting of (a-1-1) individuals, another one consisting of one individual, and still another one consisting of one (other) individual — $\frac{a!}{(a\text{-}2)!\,1!\,1!}$.

(d) Subevent III: (a-1) individuals make choice only within their own subgroups (choosing none in B); and one individual makes three choices into subgroup B.

We have assumed implicitly, in the preceding case, that $d \geqslant 3$. But suppose d were to be defined $d = 2$. Then the last subevent (d above) could not happen at all, because no individual could make three choices by definition. The required probability would then be composed of only the first two terms (of Equation 11).

E. A General Comment

No readymade general definition is available, whereby we could write an algebraic expression for the expectancy of t choices, when $t \leqslant da$.

But a few important rules of thumb may be clearly seen: (1) An event $P(A\text{-}B)_t$ tends to be composed of subevents. (2) These subevents are merely the ways in which a members of A, given d choices per chooser, may make up a total of t choices to subgroup B. (3) The sum of the powers of the p_r's in each subevent must be equal to a, the size of the subgroup A. (4) The combinatorial coefficient always corresponds to the number of ways in which the population A may be divided into subgroups (two, three, or more such subgroups). (5) The combinatorial term will always have an ! in the nominator. (6) Its denominators will be equal to the factorials of the powers of the p_r's. (7) Subevents in which the subscript of p, $/_r$, would exceed the value of d must be excluded (as more than r d choices cannot be made by any individual by definition). (8) It is obvious that the specific probability terms can be cumulated:

(a) The probability that members of A make *one or less* choices into subgroup B must then be

(Eq. 12) $$P(A\text{-}B)_{\leqslant 1} = P(A\text{-}B)_0 + P(A\text{-}B)_1.$$

(b) The probability that members of A make *five or less* choices into subgroup B will be

(Eq. 13) $$P(A\text{-}B)_{\leqslant 5} = P(A\text{-}B)_0 + (P(A\text{-}B)_1 + P(A\text{-}B)_2 + + P(A\text{-}B)_3 + P(A\text{-}B)_4 + P(A\text{-}B)_5.$$

(c) The probability that members of A make *between three and five* (no less than three and no more than five) choices into subgroup B is

(Eq. 14) $$P(A\text{-}B)_{3\leqslant t\leqslant 5} = P(A\text{-}B)_3 + P(A\text{-}B)_4 + P(A\text{-}B)_5.$$

(d) The probability that members of A make *three or more* choices into subgroup B becomes

(Eq. 15) $$P(A\text{-}B)_{\geqslant 3} = 1 - [P(A\text{-}B_0 + P(A\text{-}B)_1 + (A\text{-}B_2].$$

(e) And so on.

F. An Example

Let there be a group N = 20, consisting of ten males, A = 10, and ten females, B = 10. Let d = 3.

Then, by Equation 2, the probability that a specific male, a_1, make no choice into the female population B, is

(Eq. 16) $$p_0 = .087.$$

And the subsequent probabilities (that he chooses 1, 2, 3 females) are

(Eq. 17) $p_1 = .372$ by Equation 4 or 6

(Eq. 18) $p_2 = .418$ by Equation 5 or 6

(Eq. 19) $p_3 = .123$ by Equation 6

Obviously, since these are all the events admissible, the sum of these probabilities must be equal 1.00,

(Eq. 20) $$p_0 + p_1 + p_2 + p_3 = .087 + .372 + .418 + .123 = 1.00.$$

Now for the intergroup choice probabilities. The expectancy that all the members of A make no choice to subgroup B is

(Eq. 21) $$p_0^{10} = (.087)^{10} = .0000000000248 = P(A\text{-}B)_0.$$

And the subsequent probabilities,

(Eq. 22) $$P(A\text{-}B)_1 = (.087)^9 \cdot (.372)\ .10 = .00000000106$$

(Eq. 23) $$P(A\text{-}B)_2 = (.087)^8 \cdot (.372)^2\ .45 + (.087)^9\ (.418)\ .10 = .0000000217$$

Now if we want the exact probability that two different A members choose into subgroup B, the first term above (Eq. 23) will give us the answer, and the probability will be found to be

(Eq. 24) $$P(2 \text{ different A's choose B's}) = (.087)^8\ (.372)^2\ .45 = .0000000205.$$

Next, as to three choices into subgroup B.

(Eq. 25) $$P(A\text{-}B)_3 = (.087)^7\ (.372)^3\ .120 + (.087)^8\ (.372)\ (.418)\ .90 + (.087)^9\ (.123)\ .10 = .000000699$$

And identically,

(Eq. 26) $$P(A\text{-}B)_4 = .0000025643$$

And

(Eq. 27) $$P(A\text{-}B)_5 = .000142.$$

Now obviously, the probability that in our specified group *five or less* of all the choices made by A's (there are d.a = 30 such choices) would go into subgroup B must be

(Eq. 28) $P(A\text{-}B) = P(A\text{-}B)_0 + P(A\text{-}B)_1 + P(A\text{-}B)_2 + P(A\text{-}B)_3 + P(A\text{-}B)_4 + P(A\text{-}B)_5 = .00014528$ with rounding.

And the probability that *more than five choices* (but not as few as five) would be made is

(Eq. 29) $P(A\text{-}B)_{>5} = 1 - .000145 = .999855.$

To conclude, let us take a somewhat complex example. Let us evaluate the probability that the members of A make 10 choices into subgroup B.

We shall first list all subevents of which $P(A\text{-}B)_{10}$ if d = 3 is composed. On page 161 a convenient table is prepared:

Finally, it is vaguely possible (even though admittedly somewhat unlikely) that further refinements of expectancy formulae by the inclusion of parameters for some of the influencing factors may lead to the development of predictive models.

We have seen that the evaluation of expectancies of intergroup choices is easy, although rather laborious. From time to time, and from project to project, it may even pay to go through these computational pains. But let that be decided by those who wish to try.

TABLE OF SUBEVENTS OF $P(A\text{-}B)_{10}$

TABLE OF SUBEVENTS OF $P(A\text{-}B)_{10}$

Choice Pattern	Description	Probability	Value of P
1 1 1 1 1 1 1 1 1 1	10 different A's choose 1 B each	p_1^{10}	.0000508
2 1 1 1 1 1 1 1 1	8 A's choose 1 B each, 1 A chooses 2.	$p_0\, p_1^{8}\, p_2 \frac{a!}{(a-9)!\,8!\,1!}$	.00120
2 2 1 1 1 1 1 1	6 A's choose 1 B each; 2 A's choose 2 each	$p_0^{2}\, p_1^{6}\, p_2^{2} \frac{a!}{(a-8)!\,6!\,2!}$	.00442
2 2 2 1 1 1 1	4 A's choose 1 B each 3 A's choose 2 B's each	$p_0^{3}\, p_1^{4}\, p_2^{3} \frac{10!}{(10-7)!\,4!\,3!}$	.00387
2 2 2 2 1 1	2 A's choose 1 B each 4 A's choose 2 B's each	$p_0^{4}\, p_1^{2}\, p_2^{4} \frac{10!}{(10-6)!\,2!\,4!}$	.000762
2 2 2 2 2	5 A's choose 2 B's each	$p_0^{5}\, p_2^{5}\, \binom{10}{5}$	.000016
3 1 1 1 1 1 1 1	7 A's choose 1 B each; 1 A chooses 3 B's	$p_0^{2}\, p_1^{7}\, p_3 \frac{10!}{(10-8)!\,7!\,1!}$	.000330
3 2 1 1 1 1 1	5 A's choose 1 B each 1 A choose 2 B's 1 A chooses 3 B's	$p_0^{3}\, p_1^{5}\, p_2\, p_3 \frac{10!}{(10-7)!\,5!\,1!\,1!}$	.000225
3 2 2 1 1 1	3 A's choose 1 B each 2 A's choose 2 B's each 1 A chooses 3 B's	$p_0^{4}\, p_1^{3}\, p_2^{2}\, p_3 \frac{10!}{(10-6)!\,3!\,2!\,1!}$	.000799

3 2 2 2 1	1 A chooses 1 B 3 A's choose 2 B's each; 1 A chooses 3 B's	$p_0^5\, p_1\, p_2^3\, p_3 \dfrac{10!}{(10-5)!\,1!\,3!\,1!}$	.0000498
3 3 1 1 1 1	4 A's choose 1 B each 2 A's choose 3 B's each	$p_0^4\, p_1^4\, p_3^2 \dfrac{10!}{(10-6)!\,4!\,2!}$	.0000523
3 3 2 1 1	2 A's choose 1 B each 1 A choose 2 B's 2 A's choose 3 B's	$p_0^5\, p_1^2\, p_2\, p_3^2 \dfrac{10!}{(10-5)!\,2!\,1!\,2!}$	.0000330
3 3 2 2	2 A's choose 2 B's each 2 A's choose 3 B's each	$p_0^6\, p_2^2\, p_3^2 \dfrac{10!}{(10-4)!\,2!\,2!}$	.00000182
3 3 3 1	1 A chooses 1 B 3 A's choose 3 B's each	$p_0^6\, p_1\, p_3^3 \dfrac{10!}{(10-4)!\,3!\,1!}$	.00000126
$P(A\text{-}B)_{10}$	=		.01181098

Suppose now for a moment that d, instead of being d = 3, is defined as d = 4 in the above example. Then, in $P(A\text{-}B)_{10}$, a number of subevents would have to be added. Their respective patterns would be:
$P(A\text{-}B)_{10}$

(a) 4 1 1 1 1 1 1 (b) 4 2 1 1 1 1 (c) 4 2 2 1 1
(d) 4 2 2 2 (e) 4 3 1 1 1 (f) 4 3 2 1
(g) 4 3 3 (h) 4 4 1 1 (i) 4 4 2.

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